PHOTOFACT* FOLDER SET

*TRADE MARK

NO. 73

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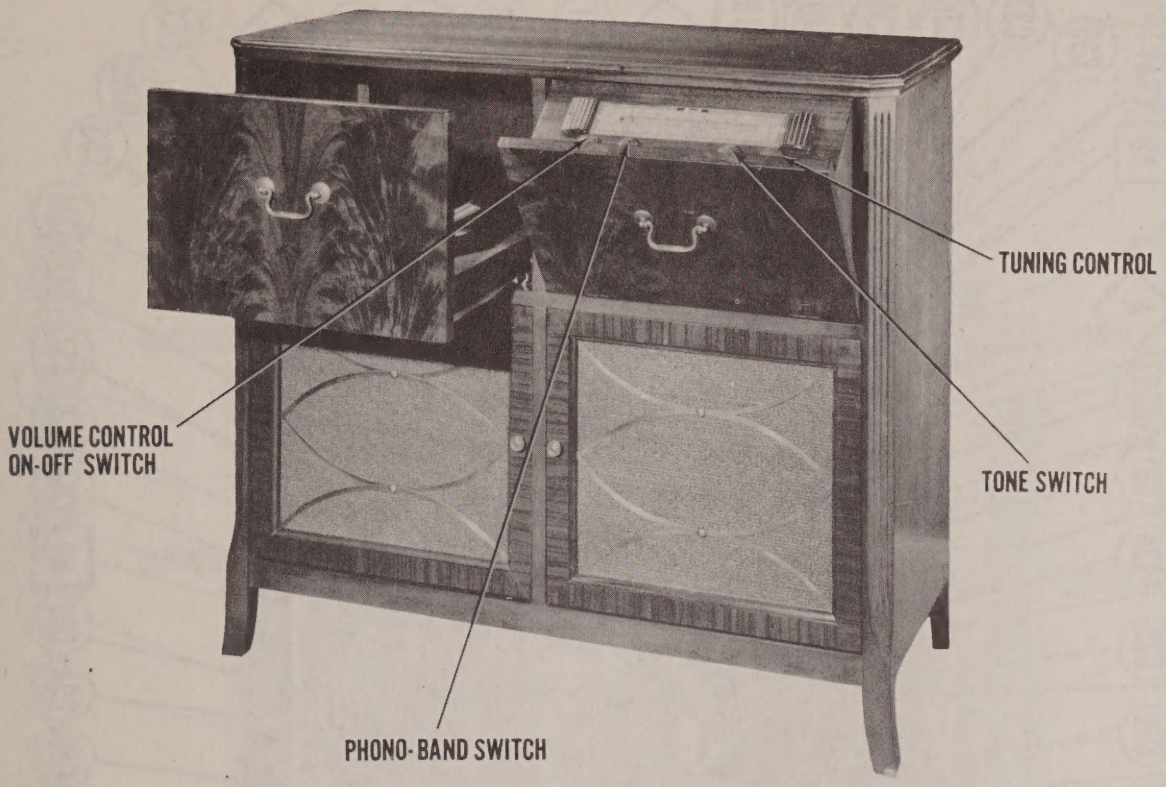
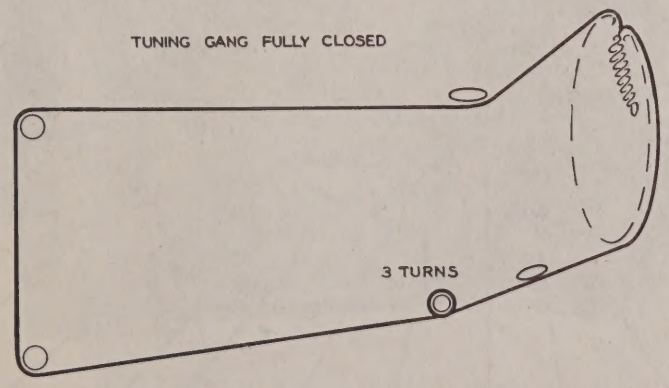


AIRCASTLE
MODEL 121104

AIRCASTLE
MODEL 121104

AIRCASTLE MODEL 121104

TRADE NAME	Aircastle, Model 121104
SUPPLIER	Spiegel, Inc., 1061 W. 35th St., Chicago, Illinois
TYPE SET	AC Operated Combination Phono-Radio, AM-FM Superheterodyne Receiver with Loop Antenna.
TUBES(TEN)	Types 12BA6 FM RF Amp., 12BE6 FM Converter, 12BA6 FM 1st IF Amp., 12BA6 FM 2nd IF Amp., 12BA6 FM 3rd IF Amp., 6AL5 Ratio Det., 12BE6 AM Converter, 12BA6 AM IF Amp., 12AT6 DET-AVC-AF, 50L6GT Power Output.
POWER SUPPLY 110-120 Volts AC	RATING: .68 Amp. @ 117 Volts AC
TUNING RANGE-BROADCAST 540-1600KC	FREQ. MOD. 88-108MC



DIAL CORD DRIVE

HOWARD W. SAMS & CO., INC. • Indianapolis Indiana

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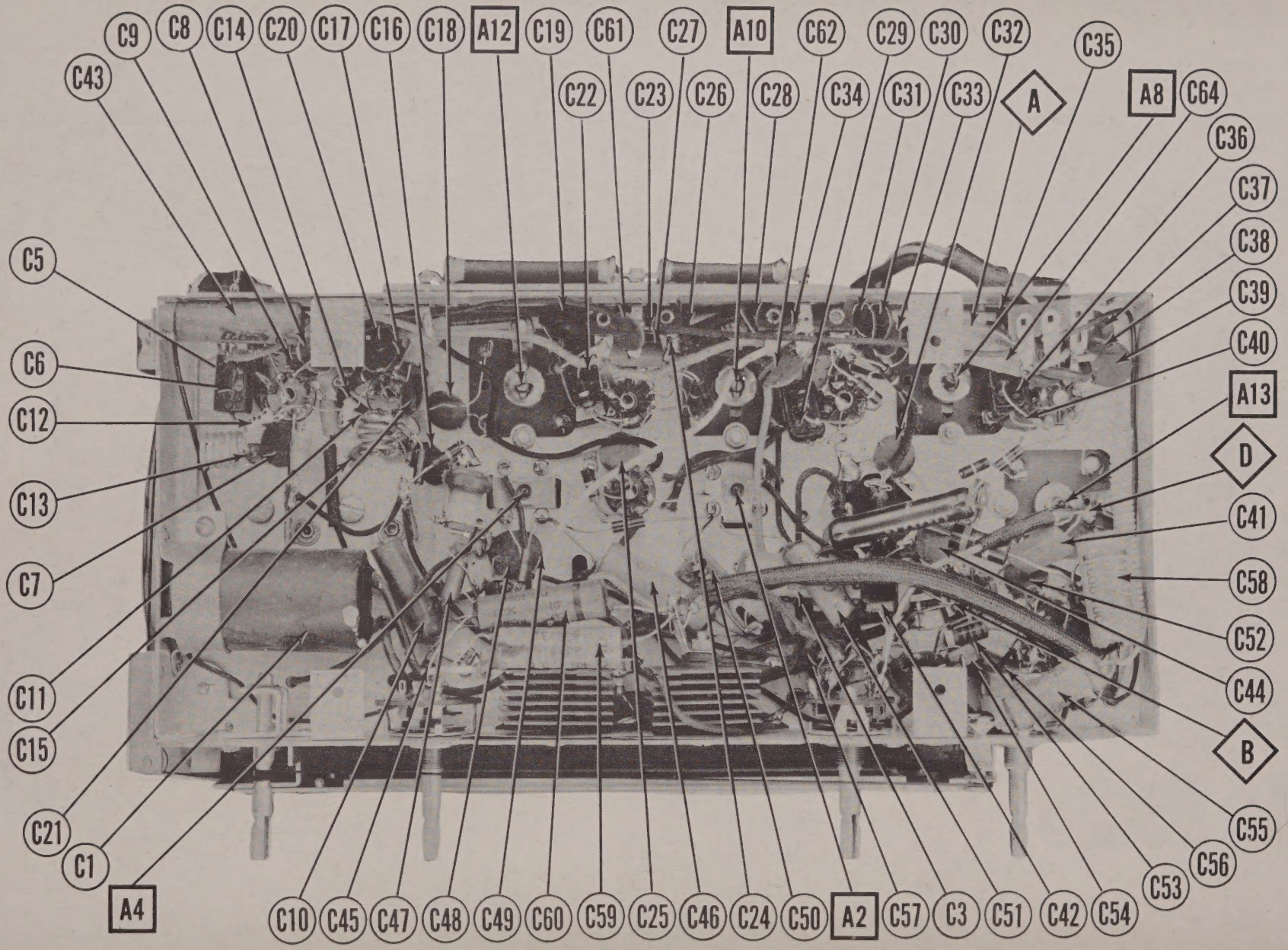
C9
C8
C14
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R7
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L21
R9
R10
L15
R11
R12
R13
R14
R15
R16
R39
R17
R18
R20

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: AIRCASTLE PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	FM RF Amp.	12BA6	12BA6	7BK	
V2	FM Converter	12BE6	12BE6	7CH	
V3	FM 1st IF Amp.	12BA6	12BA6	7BK	
V4	FM 2nd IF Amp.	12BA6	12BA6	7BK	
V5	FM 3rd IF Amp.	12BA6	12BA6	7BK	
V6	Ratio Det.	6AL5	6AL5	6BT	
V7	AM Converter	12BE6	12BE6	7CH	
V8	AM IF Amp.	12BA6	12BA6	7BK	
V9	AM DET-AVC-AF	12AT6	12AT6	7BT	
V10	Power Output	50L6GT	50L6GT	7AC	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: AIRCASTLE PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1	60	150	A18-285	PRS150/50	BR5015		UT-501	Voltage Doubler
C2A	40	350	A18-284	AF88J	UP4445		TVL-64	■ Filter
B	20	400		PRS450/20	BR2045		UT-20	▬ Filter Note 1
C	40	250						▲ Filter
C3	4	150	A18-273	PRS150/4	BR415		UT-41	Stabilizing Cap
C4	50	500	A15-194	1468-00005	5W5Q5	GP1K-50	1FM-45	Ant. Isolation Note 2
C5	50		A15-194	1468-00005	5W5Q5	GP1K-50	1FM-45	RF Coupling
C6	470	500	A15-200	1468-0005	5W5T5	GP2K-500	1FM-35	FM RF Cath. Bypass
C7	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM RF Screen Bypass
C8	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM RF Fil. Bypass
C9	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM RF Fil. Bypass
C10	.01	400	A16-165	P488-01	GT4S1	GP2-335-01	TM-11	RF Bypass
C11	20		A15-198	1468-000025	5W5Q2	GP1K-25	MS-42	RF Coupling
C12	20		A15-198	1468-000025	5W5Q2	GP1K-25	MS-42	RF Coupling
C13	75		A15-195	1469-000075	5R5Q7	GP1K-75	MS-47	Fixed Padder
C14	10		A15-197	1468-00001	5W5Q1	GP1K-10	MS-41	FM Osc. Grid Cap
C15	50		A15-194	1469-00005	5R5Q5	GP1K-50	MS-45	Fixed Padder
C16	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM Osc. Anode Bypass
C17	20		A15-193		5R5Q2	NP0K-20	MS-42	Fixed Trimmer
C18	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM Conv. Decoupling
C19	430	500	A15-200	1468-0005	5W5T5	GP2K-500	1FM-35	AVC Filter
C20	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM Conv. Fil. Bypass
C21	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM Conv. Fil. Bypass
C22	.01	100	A16-163	P488-01	GT2S1	GP2-335-01	TM-11	FM 1st IF Cath. Byp.
C23	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM 1st IF Fil. Byp.
C24	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM 1st IF Fil. Byp.
C25	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM 1st IF Screen Byp.
C26	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM 1st IF Plate Dec.
C27	.01	200	A16-165	P488-01	GT2S1	GP2-335-01	TM-11	RF Bypass
C28	470	500	A15-200	1468-0005	5W5T5	GP2K-500	1FM-35	AVC Filter
C29	.01	100	A16-163	P488-01	GT2S1	GP2-335-01	TM-11	FM 2nd IF Cath. Bypass
C30	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM 2nd IF Fil. Bypass
C31	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM 2nd IF Fil. Bypass
C32	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM 2nd IF Screen Bypass
C33	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM 2nd IF Plate Dec.
C34	.01	200	A16-165	P488-01	GT2S1	GP2-335-01	TM-11	RF Bypass
C35	470	500	A15-200	1468-0005	5W5T5	GP2K-500	1FM-35	FM 3rd IF Grid Filter
C36	.01	100	A16-163	P488-01	GT2S1	GP2-335-01	TM-11	FM 3rd IF Cath. Bypass
C37	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM 3rd IF Fil. Bypass
C38	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM 3rd IF Fil. Bypass
C39	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM 3rd IF Screen Bypass
C40	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM 3rd IF Plate Dec.
C41	250	500	A15-199	1468-00025	5W5T25	GP2K-250	1FM-325	Diode Load Cap Note 3
C42	.003	200	A16-180	P688-003	GT6D3	GP2M-003	TM-23	De-emphasis
C43	.1	200	A16-157	P288-1	GT2P1		TM-1	AVC Filter
C44	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	FM Det. Fil. Bypass
C45	100		A15-190	1468-0001	5W5T1	GP1K-100	1FM-31	RF Coupling
C46	.05	400	A16-158	P488-05	GT4S5		TM-15	AVC Filter
C47	50		A15-191	1468-00005	5W5Q5	GP1K-50	1FM-45	Osc. Grid Cap.
C48	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	AM Conv. Fil. Bypass
C49	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	AM Conv. Fil. Bypass
C50	250	500	A15-176	1468-00025	5W5T25	GP2K-250	1FM-325	Diode RF Filter
C51	.01	200	A16-165	P488-01	GT2S1	GP2-335-01	TM-11	Audio Coupling

PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	RATING: IMPEDANCE SEC.	RATING: DC RES. PRI.	RATING: DC RES. SEC.	REPLACEMENT DATA: AIRCASTLE PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.	INSTALLATION NOTES
T1	3500Ω	3.3Ω	340Ω	.5Ω	A80-241	A-3849#	A-2905	RO-9#	# Drill One New Mounting Hole.

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA: AIRCASTLE PART No.	REPLACEMENT DATA: JENSEN PART No.	REPLACEMENT DATA: QUAM PART No.	INSTALLATION NOTES
SP1	FIELD / PM / CONE DIA.	V.C. IMP. 3.3Ω / V.C. DIA. 1"	A80-241	ST-120 MOD.P10-S††	10A31	†† Replace Output Transformer To Match 6-8Ω Voice Coil
SP2	9 3/8"					

FILTER CHOKE

ITEM No.	RATINGS: TOTAL DIRECT CURRENT	RATINGS: D. C. RESISTANCE	RATINGS: INDUCTANCE (0 CURRENT 1000 ∽)	REPLACEMENT DATA: AIRCASTLE PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.	INSTALLATION NOTES
L1	.116A	164Ω	3.3Henries	A33-225			R-885	

R F COILS

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: AIRCASTLE PART No.	REPLACEMENT DATA: MEISSNER PART No.
L2	FM Ant.Coil	0Ω		SB10-488	
L3	RF Choke	.7Ω		A33-226	
L4	FM RF Coil	0Ω		B10-489	
L5	FM Osc.Coil	0Ω		B10-490	
L6	FM 1st IF	1Ω	0Ω	SA10-493	
L7	FM 2nd IF	1Ω	.1Ω	SA10-494	
L8	FM 3rd IF	1Ω	.1Ω	SA10-494	
L9	Ratio Det. Trans.	1.8Ω	.2Ω	SC10-492	
L10	AM Loop Ant.	1.2Ω		S84-245	
L11	AM Ant. Loading	2Ω		A10-504	
L12	AM Osc.Coil	1Ω	5.5Ω	B10-491	
L13	AM 1st IF	18.5Ω	20.5Ω	A10-499	16-6678
L14	AM 2nd IF	14Ω	18Ω	A10-500	16-6678
L15	Filament Choke		.6Ω	A33-226	
L16	Filament Choke		.6Ω	A33-226	
L17	Filament Choke		.6Ω	A33-226	
L18	Filament Choke		.6Ω	A33-226	
L19	Filament Choke		.1Ω	A33-227	
L20	Filament Choke		.1Ω	A33-226	
L21	Filament Choke		.1Ω	A33-226	

DIAL LIGHTS

ITEM No.	BASE TYPE	VOLTS	AMPS.	BEAD COLOR	REPLACEMENT DATA: AIRCASTLE PART No.	NOTES
M1	Bayonet	6-8	.15	Brown		Type #47
M2	Bayonet	6-8	.15	Brown		Type #47

PARTS LIST AND DESCRIPTIONS (Continued)

ITEM No.	RATING CAP.	RATING VOLT	AIRCASTLE PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C52	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	AF Plate Decoupling
C53	100		A15-196	1468-0001	5W5T1	GP1K-100	1FM-31	AF Plate Bypass
C54	.002	200	A16-178	P688-002	GT6D2	GP2M-002	TM-22	Audio Coupling
C55	.02	400	A16-150	P488-02	GT4S2		TM-12	Tone Compensation
C56	.005	600	A16-153	P688-005	GT6D5	GP2M-005	TM-25	Audio Coupling
C57	.01	1000	A16-165	P688-01	GT6S1	GP2-335-01	TM-11	RF Bypass
C58	.005	1600	A16-153	P688-005	GT6D5		TM-25	Output Plate Bypass
C59	.05	400	A16-158	P488-05	GT4S5		TM-15	Tone Compensation
C60	.01	1000	A16-156	P688-01	GT6S1		TM-11	Tone Compensation
C61	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	Filament Bypass
C62	5000		A16-177	1467-005	1D5D5	GP2M-005	1FM-25	Filament Bypass
C63	.02	400	A16-150	P488-02	GT4S2		TM-12	Phono Isolation
C64	.05	400	A16-158	P488-05	GT4S5		TM-15	Line Filter

Note 1. Some Models Use 40MFD In This Application.
Note 2. Some Models Use .02MFD In This Application.
Note 3. Some Models Use 300MMF In This Application.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	AIRCASTLE PART No.	IRC PART No.	CLAROSTAT PART No.	INSTALLATION NOTES
R1A	1 Meg.	½	B24-173	Q13-137X	AT-98	Volume control, tapped @ 250KΩ
B	Shaft		Not Req.	Not Req.	KSS-3	Attach to R1A per instructions
C	Switch		Not Req.	76-1	SW-A	Attach to R1A per instructions

RESISTORS

ITEM No.	RATING RESISTANCE	RATING WATTS	AIRCASTLE PART No.	IRC PART No.	IDENTIFICATION CODES
R2	1 Meg.	½	A60-668	BTS-1 Meg.	FM RF Grid
R3	68Ω	½	A60-742	BW-½-68	FM RF Cathode
R4	100Ω	½	A60-743	BW-½-100	FM RF Screen Decoupling
R5	22KΩ	½	A60-744	BTS-22K	FM Conv. Grid
R6	100Ω	½	A60-743	BW-½-100	FM Conv. Plate Decoupling
R7	22KΩ	½	A60-744	BTS-22K	FM Osc. Grid
R8	100Ω	½	A60-743	BW-½-100	FM Osc. Plate Decoupling
R9	100KΩ	½	A60-727	BTS-100K	AVC Network
R10	68Ω	½	A60-742	BW-½-68	FM 1st IF Cathode
R11	100Ω	½	A60-743	BW-½-100	FM 1st IF Screen Decoupling
R12	100Ω	½	A60-743	BW-½-100	FM 1st IF Plate
R13	100KΩ	½	A60-727	BTS-100K	AVC Network
R14	68Ω	½	A60-742	BW-½-68	FM 2nd IF Cathode
R15	100Ω	½	A60-743	BW-½-100	FM 2nd IF Screen Decoupling
R16	100Ω	½	A60-743	BW-½-100	FM 2nd IF Plate Decoupling
R17	100KΩ	½	A60-727	BTS-100K	FM 3rd IF Grid
R18	68Ω	½	A60-742	BW-½-68	FM 3rd IF Cathode
R19	100Ω	½	A60-743	BW-½-100	FM 3rd IF Screen Decoupling
R20	100Ω	½	A60-743	BW-½-100	FM 3rd IF Plate Decoupling
R21	270Ω	½	A60-723	BW-½-270	Balancing
R22	27KΩ	½	A60-745	BTS-27K	De-emphasis
R23	22KΩ	½	A60-744	BTS-22K	Ratio Det. Diode Load
R24	100KΩ	½	A60-727	BTS-100K	AVC Network
R25	33KΩ	½	A60-748	BTS-33K	Tone Compensation
R26	220KΩ	½	A60-667	BTS-220K	Series Phono Pick-Up
R27	1 Meg.	½	A60-668	BTS-1 Meg.	AM Conv. Grid
R28	22KΩ	½	A60-744	BTS-22K	AM Osc. Grid
R29	68Ω	½	A60-742	BW-½-68	AM 1st IF Cathode
R30	2.2 Meg.	½	A60-726	BTS-2.2 Meg.	AVC Network
R31	470KΩ	½	A60-731	BTS-470K	Diode Load
R32	10 Meg.	½	A60-728	BTS-10 Meg.	AF Grid
R33	270KΩ	½	A60-747	BTS-270K	AF Plate
R34	270KΩ	½	A60-747	BTS-270K	AF Plate
R35	2.2 Meg.	½	A60-726	BTS-2.2 Meg.	AVC Network
R36	470KΩ	½	A60-731	BTS-470K	Output Grid
R37	150Ω	1	A60-741	BW-1-150	Output Cathode
R38	27KΩ	2	A60-740	BT-2-27K	Bleeder
R39	2000Ω	10	A60-739	AB-2000	Filter Wire Wound
R40	15Ω	3	A60-738		Surge Limiter Wire Wound
R41	700Ω	5	*		Line Dropping Wire Wound
R42	600Ω	5	*		Line Dropping Wire Wound

* Special Compensating Resistor, To Replace, Order From Mfgr.

DATE 10/49 SET #73 FOLDER #1

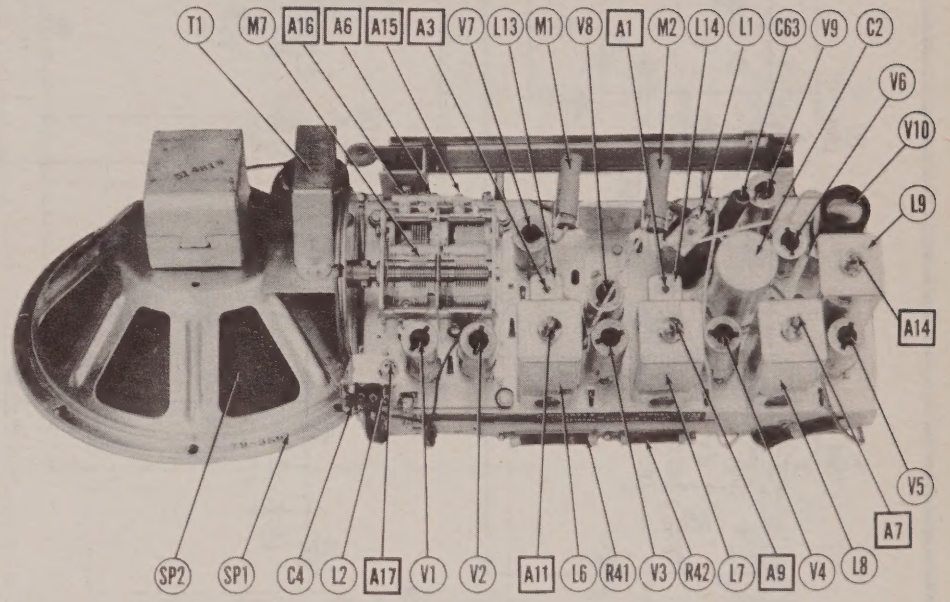
PARTS LIST AND DESCRIPTIONS (Continued)

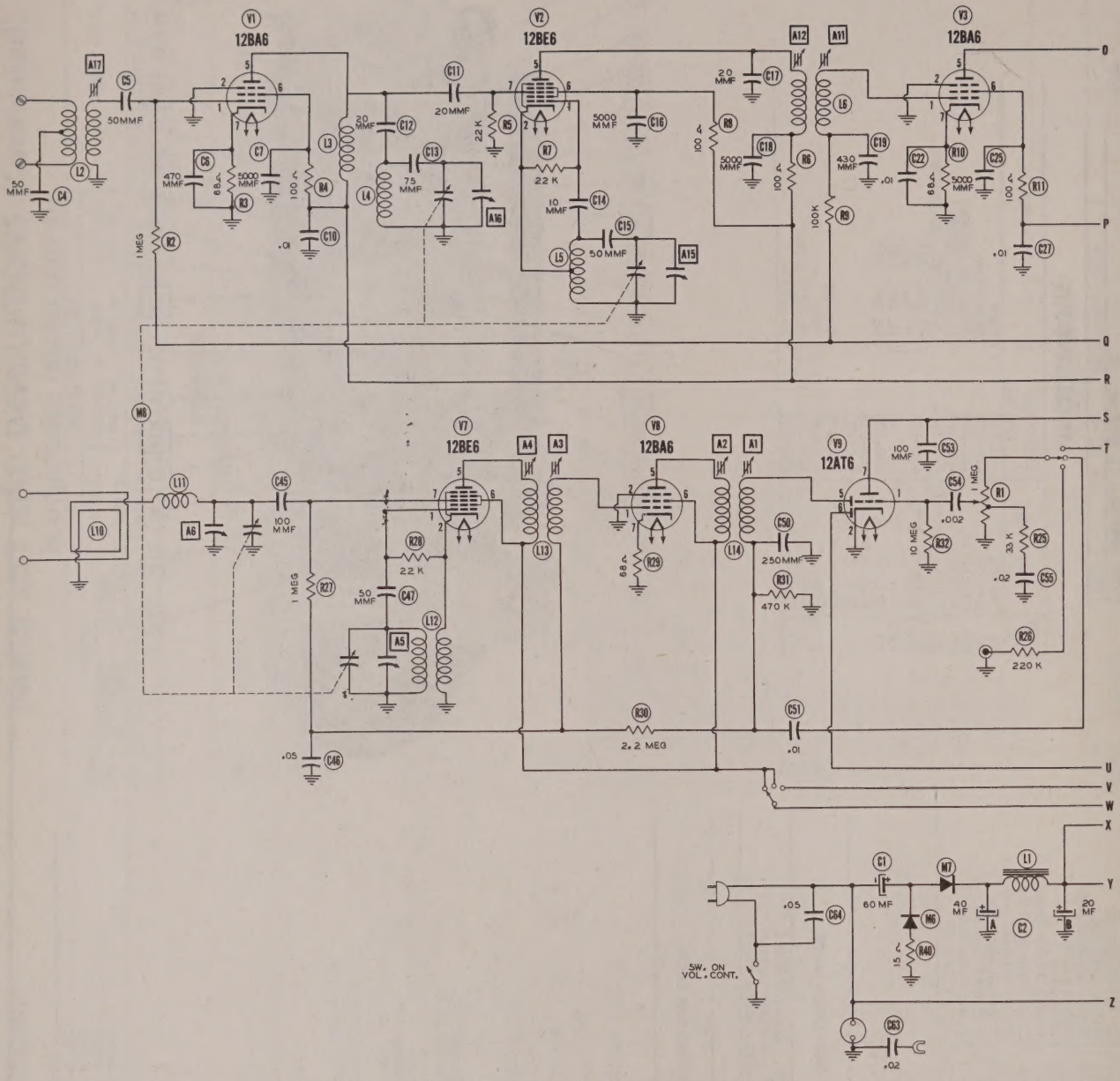
PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA AIRCASTLE PART No.	REPLACEMENT DATA ASTATIC PART No.	REMARKS
M3		LT2-M	

MISCELLANEOUS

ITEM No.	PART NAME	AIRCASTLE PART No.	NOTES
M4	Switch	A26-125	Tone
M5	Switch	A69-178	Band-Phono
M6	Rectifier	A83-463	Selenium (150MA)
M7	Rectifier	A83-463	Selenium (150MA)
M8	2 Gang Var.Cap.	C19-191	(14-571MMF, 30-282MMF)
A5	Trimmer Strip	A20-144	AM Osc. Adj.
A15			FM Osc. Adj.
A16			FM Ant. Adj.
A6	Trimmer	A20-139	AM Ant. Adj.
	Dial Scale	C67-532	
	Dial Pointer	A58-68	
	Knob	A52-263	Tuning
	Knob	A52-260	Tone
	Knob	A52-261	On-Off/Volume
	Knob	A52-262	PH-AM-FM





VOLTAGE READINGS

	Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
‡	V 1	12BA6	0V	0V	41VAC	29VAC	95VDC	95VDC	1VDC	
‡	V 2	12BE6	§-.5VDC	0V	17VAC	6VAC	95VDC	95VDC	0V	
‡	V 3	12BA6	.1VDC	0V	41VAC	51VAC	95VDC	95VDC	1VDC	
‡	V 4	12BA6	0V	0V	51VAC	64VAC	95VDC	95VDC	1.1VDC	
‡	V 5	12BA6	-.1VDC	0V	17VAC	30VAC	95VDC	95VDC	.8VDC	
‡	V 6	6AL5	0V	-3VDC	0V	6VAC	-8.5VDC	0V	0V	
	V 7	12BE6	§-6VDC	0V	29VAC	13VAC	95VDC	95VDC	0V	
	V 8	12BA6	-.1VDC	0V	75VAC	64VAC	95VDC	95VDC	.9VDC	
	V 9	12AT6	-.6VDC	0V	12VAC	6VAC	-.3VDC	.1VDC	50VDC	
	V 10	50L6GT	0V	30VAC	230VDC	95VDC	0V	75VDC	75VAC	7.2VDC

§ Taken with vacuum tube voltmeter.
‡ Taken in FM position.

RESISTANCE READINGS

	Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
‡	V 1	12BA6	1 Meg.	0Ω	39Ω	28Ω	†2KΩ	†2KΩ	68Ω	
‡	V 2	12BE6	22KΩ	0Ω	15Ω	4Ω	†2.2KΩ	†2.2KΩ	22KΩ	
‡	V 3	12BA6	220KΩ	0Ω	40Ω	51Ω	†2.2KΩ	†2.2KΩ	68Ω	
‡	V 4	12BA6	220KΩ	0Ω	52Ω	64Ω	†2.2KΩ	†2.2KΩ	68Ω	
‡	V 5	12BA6	100KΩ	0Ω	15Ω	27Ω	†2.2KΩ	†2.2KΩ	68Ω	
‡	V 6	6AL5	0Ω	22KΩ	0Ω	3Ω	1 Meg.	Inf.	1 Meg.	
	V 7	12BE6	22KΩ	.5Ω	27Ω	11Ω	†2KΩ	†2KΩ	3.5Meg.	
	V 8	12BA6	2.5 Meg.	0Ω	75Ω	64Ω	†2KΩ	†2KΩ	68Ω	
	V 9	12AT6	10 Meg.	0Ω	11Ω	4Ω	470KΩ	122KΩ	†550KΩ	
	V 10	50L6GT	Inf.	27Ω	†500Ω	†2KΩ	470KΩ	150Ω	75Ω	

‡ Taken in FM position.
† Measured from output of M5.

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

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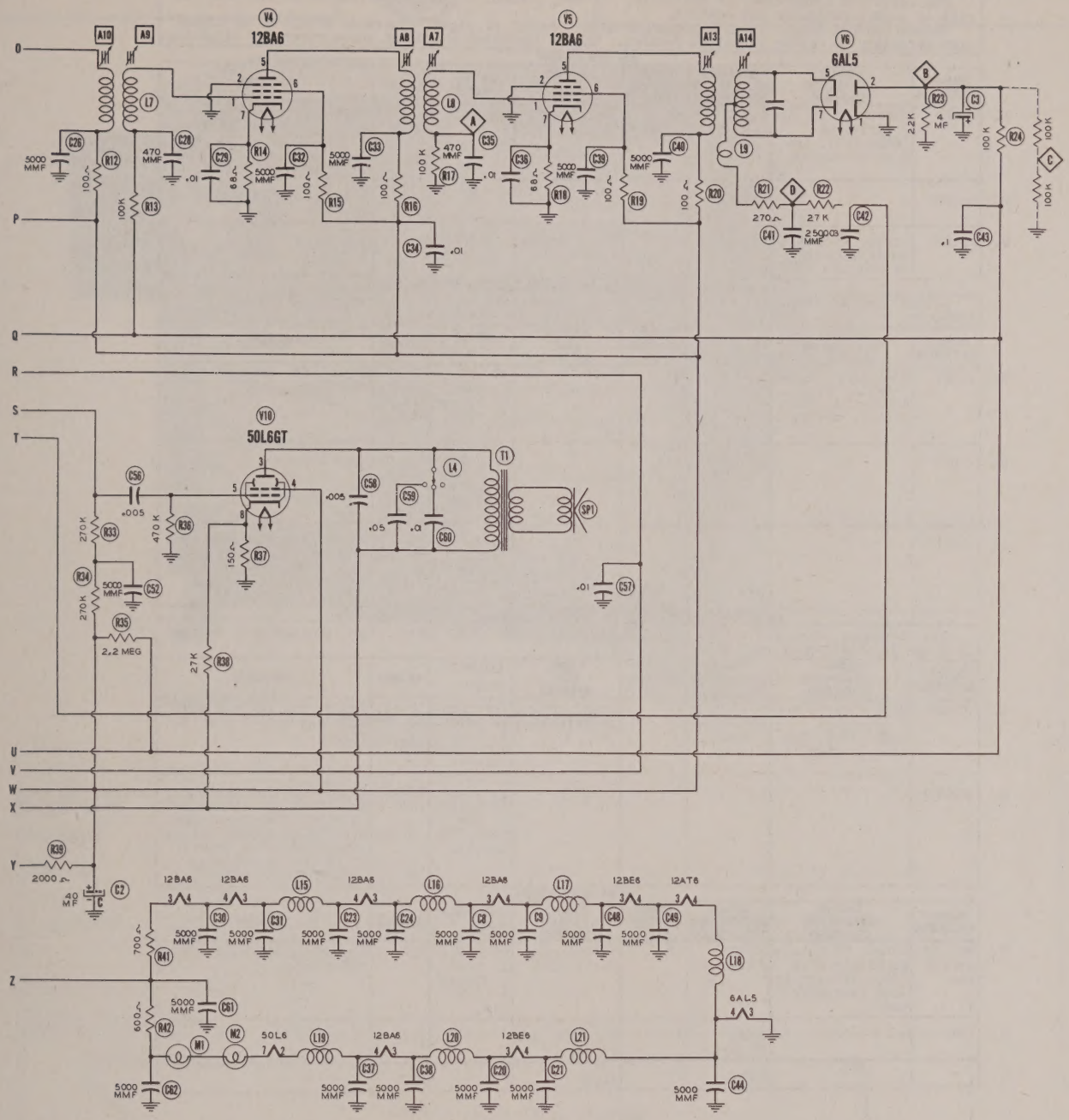

IF=455 KC AM

IF=10.7 MC FM

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

To set dial pointer, turn tuning gang fully closed and set the pointer 1/2" to the right of the left hand edge of the celluloid dial backplate.

Use isolation transformer if available. If not, connect a .1MFD capacitor in series with low side of signal generator and chassis.

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

AM ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to pin 7 (Grid) of 12BE6 (V7). Low side to chassis.	455KC (400∿ Mod.)	AM (center)	Tuning gang fully open	Across voice coil	A1,A2, A3,A4	Adjust for maximum output. If isolation transformer is not used reduce dummy antenna to .001MFD to reduce hum modulation.
2.	250MMF	"	1600KC	"	"	"	A5	Adjust for maximum output.
3.	250MMF	Across AM external antenna terminals.	1400KC	"	Tune for max. signal	"	A6	"

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect two matched 100KΩ (±1%) resistors in series from Point B to chassis. The junction of these two resistors is alignment Point C as shown on the schematic.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
4.	.1MFD	High side to pin 7 (Grid) of 12BE6 (V2). Low side to chassis.	10.7MC (Unmod.)	FM (CCW)	Point on non interference	DC Probe to Point A. Common to chassis.	A7,A8, A9,A10, A11, A12	Adjust for maximum deflection.
5.	.1MFD	"	"	"	"	DC Probe to Point B. Common to chassis.	A13	"
6.	.1MFD	"	"	"	"	DC Probe to Point D. Common to Point C.	A14	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
4.	.05MFD	High side to pin 7 (Grid) of 12BE6 (V2). Low side to chassis.	10.7MC (450KC Sweep)	FM	Point of non interference	Vert.Amp. to Point A. Low side to chassis.	A7,A8, A9,A10, A11, A12	Adjust for maximum amplitude and symmetry as per Fig 1.
5.	.05MFD	"	"	"	"	Vert.Amp. to Point D. Low side to chassis.	A13, A14	Adjust A13 for maximum amplitude and straightness of crossover lines per Fig 2. Adjust A14 so crossover point occurs at center of pattern. Continue with step 7.

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
7.	Two 150Ω carbon res.	Across FM antenna terminals with 150Ω resistor in each generator lead.	109MC (Unmod.)	FM	Tuning gang fully open	DC Probe to Point A. Common to chassis.	A15	Adjust for maximum deflection.
8.	"	"	103MC (Unmod.)	"	Tune for max. signal	"	A16	"
9.	"	"	100MC	"	100MC	"	A17	"

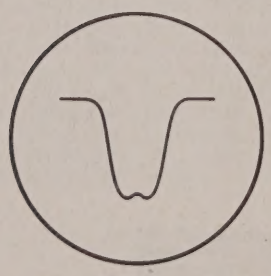
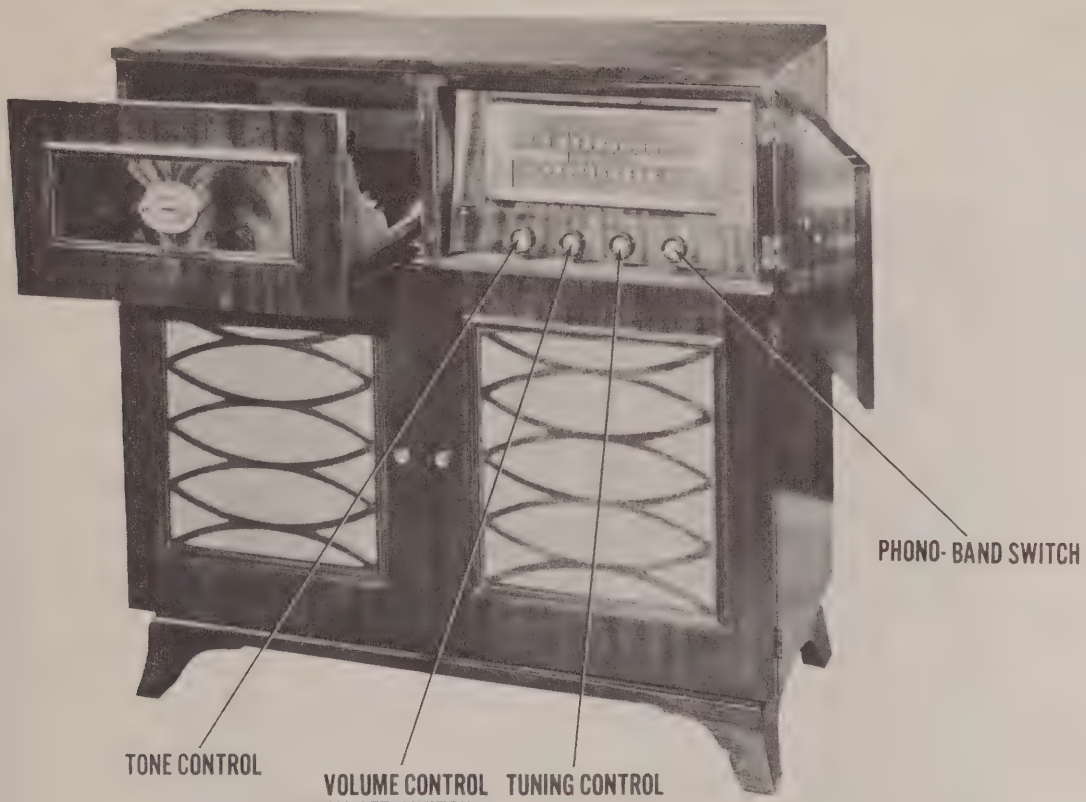


FIG. 1

FIG. 2

CORONADO MODELS 94RA1-43-7656A, 94RA1-43-7657A

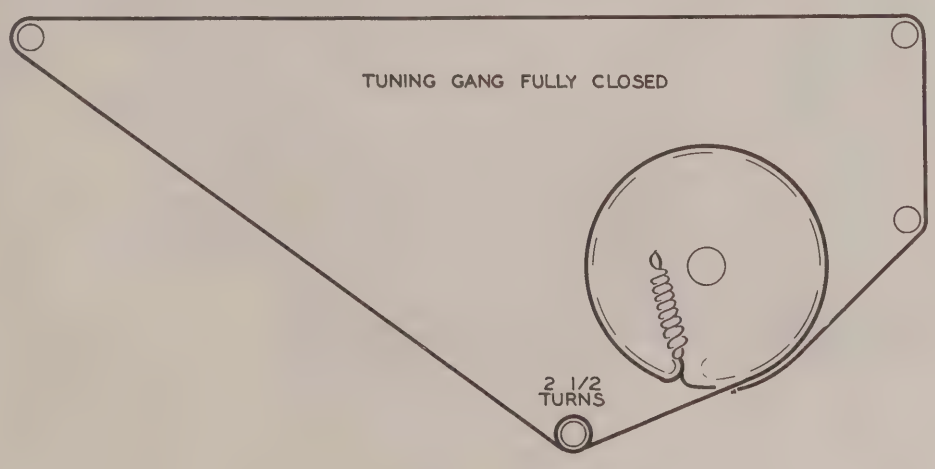
CORONADO MODELS 94RA1-43-7656A, 94RA1-43-7657A



CORONADO MODELS 94RA1-43-7656A, 94RA1-43-7657A

CORONADO MODEL 94RA1-43-7656A

TRADE NAME	Coronado, Models 94RA1-43-7656A, 94RA1-43-7657A
SUPPLIER	Gamble-Skogmo, Inc., 15 N. 8th St., Minneapolis, Minnesota
TYPE SET	AC Operated Combination Phono-Radio, AM-FM Superheterodyne Receiver with Loop Antenna
TUBES(TEN)	Types 6BA6 RF Amp., 12AT7 Converter, 6BA6 1st IF Amp., 6BA6 2nd FM IF Amp., 6AL5 Ratio Det., 6AV6 AM DET-AVG-AF, 6AV6 Phase Inverter, (2) 6K6GT Power Output, 5Y3GT Rectifier
POWER SUPPLY	105-125 Volts AC — RATING: .70 Amp. @ 117 Volts AC
TUNING RANGE-BROADCAST	540-1600KC — FREQ. MOD. 88-108MC



DIAL CORD DRIVE

HOWARD W. SAMS & CO., INC. • Indianapolis Indiana

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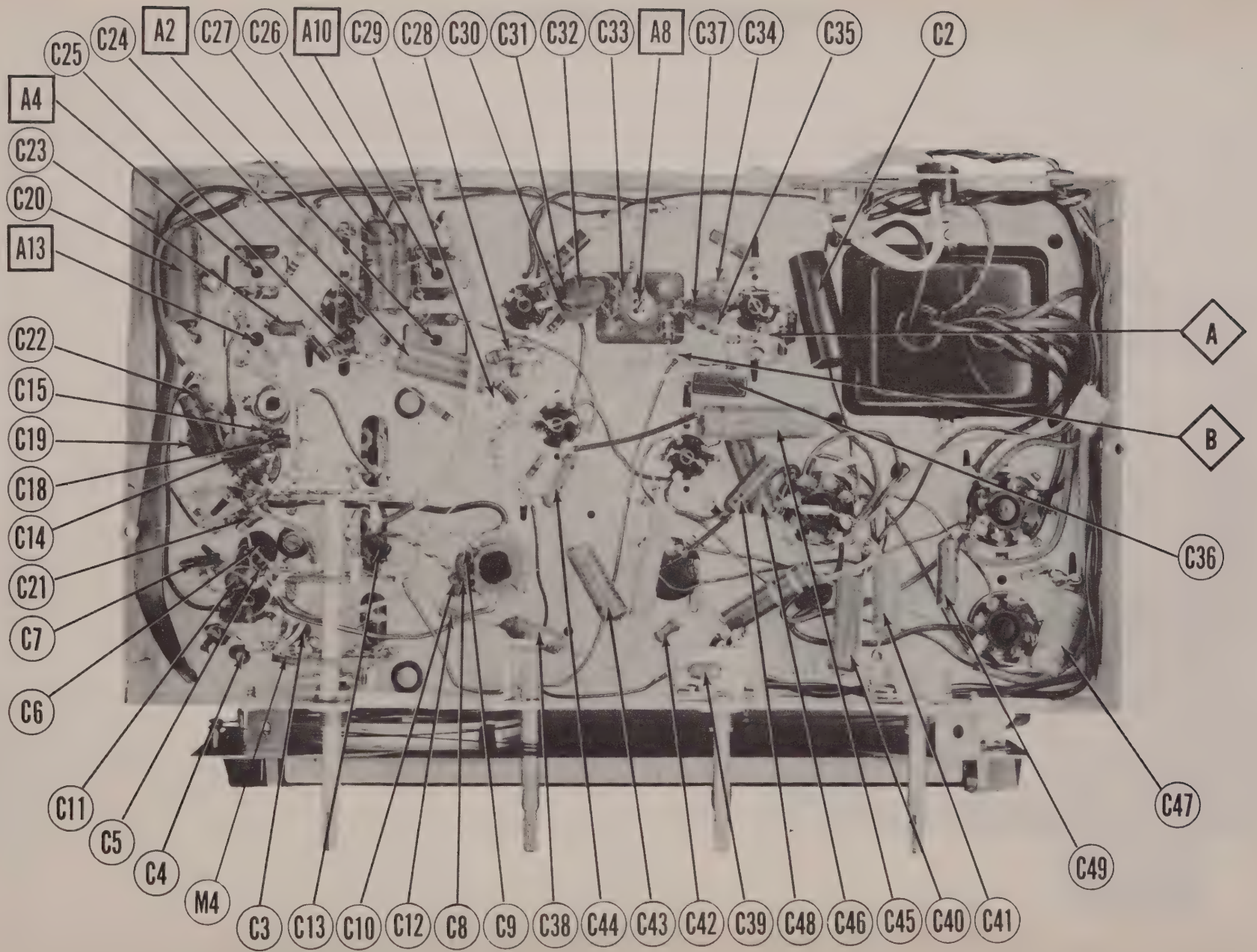
DATE 10/49 SET #73 FOLDER #2


A2
A10
A8
A4
A13
C25
C24
C27
C26
C29
C28
C30
C31
C32
C33
C37
C34
C35
C2
C23
C20
C22
C15
C19
C18
C14
C21
C7
C6
C11
C5
C4
M4
C3
C13
C10
C12
C8
C9
C38
C44
C43
C42
C39
C48
C46
C45
C40
C41
C49
C47
C36
A
B

R34
R2
R36
R29
R37
R1
R35
R38
R33
R31
L5
R30
R18
R3
R28
L13
R4
R6
R5
R7
L16
R8
L15
L14
R10
L7
R12
R13
R9
R14
R15
R17
R16
R19
R20
R21
R22
R23
R32
R24
R27
R26
R25

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: CORONADO PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	RF Amp.	6BA6	6BA6	7BK	
V2	Converter	12AT7	12AT7	9A	
V3	1st IF Amp.	6BA6	6BA6	7BK	
V4	2nd FM IF Amp.	6BA6	6BA6	7BK	
V5	Ratio Det.	6AL5	6AL5	6BT	
V6	DET-AVC-AF	6AV6	6AV6	7BT	
V7	Phase Inverter	6AV6	6AV6	7BT	
V8	Power Output	6K6GT	6K6GT	7S	
V9	Power Output	6K6GT	6K6GT	7S	
V10	Rectifier	5Y3GT	5Y3GT	5T	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: CORONADO PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	40	450	45X374	AF88J	UP		EL-240	◓ Filter
B	40	450		PRS25/50	9CJ1100		TA-50	■ Filter
C	40	25						▲ Output Cath. Bypass
C2	5	100	45X361	PRS150/4	BBR5-100		UT-41	Stabilizing Cap.
C3	500		47X496	1468-0005	5W5T5	GP2K-500	1FM-35	RF Coupling
C4	500		47X496	1468-0005	5W5T5	GP2K-500	1FM-35	AVC Filter
C5	500		47X496	1468-0005	5W5T5	GP2K-500	1FM-35	RF Cath. Bypass
C6	5000		47X507	1467-005	1D5D5	811-005	29C1	RF Screen Bypass
C7	5000		47X507	1467-005	1D5D5	811-005	29C1	RF Plate Decoupling
C8	100		47X550	1469-0001	5R5T1	N750L-100	MS-31	Fixed Trimmer
C9	15		47X552			GP1K-15	MS-415	Fixed Trimmer
C10	5		47X549	1468-00005	5W5V5	NP0K-5	MS-55	RF Coupling
C11	100		47X497	1468-0001	5W5T1	GP1K-100	1FM-31	RF Coupling
C12	500		47X496	1468-0005	5W5T5	GP2K-500	1FM-35	RF Coupling
C13	68		47X501	1468-000075	5W5Q7	GP1K-68	1FM-475	RF Coupling
C14	5000		47X507	1467-005	1D5D5	811-005	29C1	Conv. Cath. Bypass
C15	20		47X516		5R5Q2	NP0K-20	MS-42	Fixed Trimmer
C16	5		47X549	1469-000005	5R5V5	NP0K-5	MS-55	Fixed Trimmer
C17	1-8		26A489			532-1-8		Variable Trimmer
C18	47		47X498	1468-00005	5W5Q5	GP1K-47	1FM-45	Osc. Grid Cap.
C19	5000		47X507	1467-005	1D5D5	811-005	29C1	Conv. Decoupling
C20	.04	600	F66403	P688-04	GT6S4		TM-14	Conv. Decoupling
C21	47		47X499	1469-00005	5R5Q5	NP0M-50	MS-45	Fixed Trimmer
C22	500		47X496	1468-0005	5W5T5	GP2K-500	1FM-35	Conv. Fil. Bypass
C23	100		47X550	1468-0001	5W5T1	GP1K-100	1FM-31	IF Coupling
C24	.05	200	B66503	P288-05	GT2S5		TM-15	AVC Filter
C25	500		47X496	1468-0005	5W5T5	GP2K-500	1FM-35	1st IF Cath. Bypass
C26	.02	600	F66203	P688-02	GT6S2		TM-12	1st IF Screen Bypass
C27	.02	600	F66203	P688-02	GT6S2		TM-12	1st IF Plate Decoupling
C28	68		47X471	1468-000075	5W5Q7	GP1K-68	1FM-475	Diode RF Filter
C29A	50		47X112	1468-00005	5W5Q5	GP1K-50	1FM-45	Diode RF Filter
B	50			1468-00005	5W5Q5	GP1K-50	1FM-45	Diode RF Filter
C30	5000		47X507	1467-005	1D5D5	811-005	29C1	2nd IF Cath. Bypass
C31	5000		47X507	1467-005	1D5D5	811-005	29C1	2nd IF Screen Bypass
C32	5000		47X507	1467-005	1D5D5	811-005	29C1	2nd IF Plate Decoupling
C33	3					NP0K-3		Fixed Trimmer Note 1
C34	68		47X501	1468-000075	5W5Q7	GP1K-68	1FM-475	Diode Load Cap. Note 2
C35	68		47X501	1468-000075	5W5Q7	GP1K-68	1FM-475	Diode Load Cap. Note 2
C36	2700	500	47X492	1467-0025	1W5D25	GP2M-0027	1FM-23	De-emphasis
C37	5000		47X507	1467-005	1D5D5	811-005	29C1	AVC Filter
C38	.01	120	46X328	P488-01	GT2S1	GP2-335-01	TM-11	Audio Coupling
C39	68		47X501	1468-000075	5W5Q7	GP1K-68	MS-47	Tone Compensation
C40	.02	200	B66203	P488-02	GT2S2		TM-12	Tone Compensation
C41	.006	600	F66602	P688-006	GT6D6	GP2M-0056	TM-26	Tone Compensation
C42	20		47X516	1468-000025	5W5Q2	GP1K-22	MS-42	RF Bypass
C43	.01	600	F66103	P688-01	GT6S1	GP2-335-01	TM-11	Audio Coupling
C44	220		47X468	1468-00025	5W5T25	GP2K-220	1FM-325	AF Plate Bypass
C45	.02	600	F66203	P688-02	GT6S2		TM-12	Audio Coupling
C46	.005	600	B66502	P688-005	GT6D5	GP2M-005	TM-25	Audio Coupling
C47	.02	600	F66203	P688-02	GT6S2		TM-12	Audio Coupling
C48	.001	600	F66102	P688-001	GT6D1		TM-21	Output Plate Bypass
C49	.001	600	F66102	P688-001	GT6D1		TM-21	Output Plate Bypass

Note 1. Not Used In All Models.
Note 2. When Either Item C34 Or C35 Are Replaced, Replace Both With Capacitors Of Equal Value.

PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA: CORONADO PART No.	JENSEN PART No.	QUAM PART No.	INSTALLATION NOTES
SP1	FIELD	V.C. IMP.	12A490	ST-102‡ MOD.P12-S	12A4A	‡ Replace Output Transformer To Match 6-8Ω Voice Coil.
	PM	3.6Ω				
SP2	CONE DIA.	V.C. DIA.				
	11 3/8"	1"				

R F COILS

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: CORONADO PART No.	MEISSNER PART No.	
L1	Loop Ant.		.8Ω	9A1972		
L2	Dipole Ant.			9A2004		
L3	FM Ant.Coil		0Ω	9A2027		
L4	FM RF Coil		0Ω	9A2024		
L5	AM RF Coil	30Ω	5Ω	9A2025		
L6	FM Osc.Coil		0Ω	9A2023		
L7	AM Osc.Coil		5Ω	9A2022	14-1060	
L8	FM 1st IF	.1Ω	.1Ω	9A2034		
L9	AM 1st IF	20Ω	20Ω	9A2029		Tertiary Winding 10Ω
L10	FM 2nd IF	2Ω	.3Ω	9A2030		
L11	AM 2nd IF	18Ω	18Ω	9A1963	16-6678	
L12	Disc. Trans	2.5Ω	.1Ω	9A1970		
L13	RF Choke		1.6Ω	35A1		
L14	RF Choke		1.6Ω	35A1		
L15	RF Choke		.6Ω	9A1881		
L16	RF Choke		.2Ω	35A3		

DIAL LIGHTS

ITEM No.	BASE TYPE	VOLTS	AMPS.	BEAD COLOR	REPLACEMENT DATA: CORONADO PART No.		NOTES
M1	Bayonet	6-8	.15	Brown	7A103		Type #47
M2	Bayonet	6-8	.15	Brown	7A103		Type #47

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA: CORONADO PART No.	REPLACEMENT DATA: ASTATIC PART No.	REMARKS
M3		LT3-M	

MISCELLANEOUS

ITEM No.	PART NAME	CORONADO PART No.	NOTES
M4	Switch	2A387	Band
M5	3 Gang Var.Cap	14A207	(20-473MMF, 20-473MMF, 32-215MMF)
A14	Trimmer	26A489	FM Osc. Adj.
	Dial Glass	58X720	
	Dial Pointer	15X245	
	Knob	10A728	Blonde
	Knob	10A729	Mahogany

PARTS LIST AND DESCRIPTIONS (Continued)

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA			INSTALLATION NOTES
	RESISTANCE	WATTS	CORONADO PART No.	IRC PART No.	CLAROSTAT PART No.	
R1A	500KΩ	½	36X381	Q13-133X	AT-78	Volume control, tapped @ 125KΩ
B	Shaft		Not Req.	Not Req.	KSS-3	Attach to R1A per instructions
C	Switch		Not Req.	76-1	SW-A	Attach to R1A per instructions
R2A	3 Meg.	½	40X289	Q13-140	AM-67-Z	Tone control
B	Shaft		Not Req.	Not Req.	KSS-3	Attach to R2A per instructions

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		IDENTIFICATION CODES	
	RESISTANCE	WATTS	CORONADO PART No.	IRC PART No.		
R3	1 Meg.	½	B85105	BTS-1 Meg.	RF Grid	
R4	68Ω	½	B83680	BW-½-68-5%	RF Cathode	5%
R5	1000Ω	½	B84102	BTS-1000	RF Plate Decoupling	
R6	56KΩ	½	B84563	BTS-56K	RF Screen	
R7	100KΩ	½	B85104	BTS-100K	Conv. Grid	
R8	1000Ω	½	B84102	BTS-1000	Conv. Cathode	
R9	1000Ω	½	B84102	BTS-1000	Conv. Decoupling	
R10	10KΩ	½	B84103	BTS-10K	Osc. Grid	
R11	3300Ω	½	B84332	BTS-3300	FM RF Coil Shunt	
R12	2.2 Meg.	½	B85225	BTS-2.2 Meg	1st IF Grid	
R13	68Ω	½	B83680	BW-½-68-5%	1st IF Cathode	5%
R14	56KΩ	½	B84563	BTS-56K	1st IF Screen	
R15	1000Ω	½	B84102	BTS-1000	1st IF Plate Decoupling	
R16	100KΩ	½	B85104	BTS-100K	2nd FM IF Transformer Shunt	
R17	1 Meg.	½	B85104	BTS-1 Meg.	AVC Network	
R18	470KΩ	½	B85474	BTS-470K	Diode Load	
R19	47KΩ	½	B85473	BTS-47K	Diode Filter	
R20	68Ω	½	B83680	BW-½-68-5%	2nd FM IF Cathode	5%
R21	39KΩ	1	C84393	BTA-39K	2nd FM IF Screen	
R22	2200Ω	½	B85222	BTS-2200	2nd FM IF Plate Decoupling	
R23	27KΩ	½	B84273	BTS-27K	De-emphasis	
R24	3.6Ω	½	43X233	BW-½-3.9	Ratio Det. Filament Wire Wound	
R25	6800Ω	½	B83682	BTS-6800-5%	Ratio Det. Diode Load	5%
R26	6800Ω	½	B83682	BTS-6800-5%	Ratio Det. Diode Load	5%
R27	1 Meg.	½	B85105	BTS-1 Meg.	AVC Network	
R28	470KΩ	½	B85474	BTS-470K	Tone Compensation	
R29	15KΩ	½	B85153	BTS-15K	Tone Compensation	
R30	10 Meg.	½	B85106	BTS-10 Meg.	AF Grid	
R31	270KΩ	½	B85274	BTS-270K	AF Plate	
R32	10 Meg.	½	B85106	BTS-10 Meg.	Phase Inv. Grid	
R33	270KΩ	½	B85274	BTS-270K	Phase Inv. Plate	
R34	470KΩ	½	B85474	BTS-470K	Output Grid	
R35	8200Ω	½	B84822	BTS-8200	Output Grid	
R36	470KΩ	½	B85474	BTS-470K	Output Grid	
R37	560Ω	2	D83561	BT-2-560	Output Cathode	
R38	1400Ω	5	43X242	AB-1450	Filter Wire Wound	

TRANSFORMER (POWER)

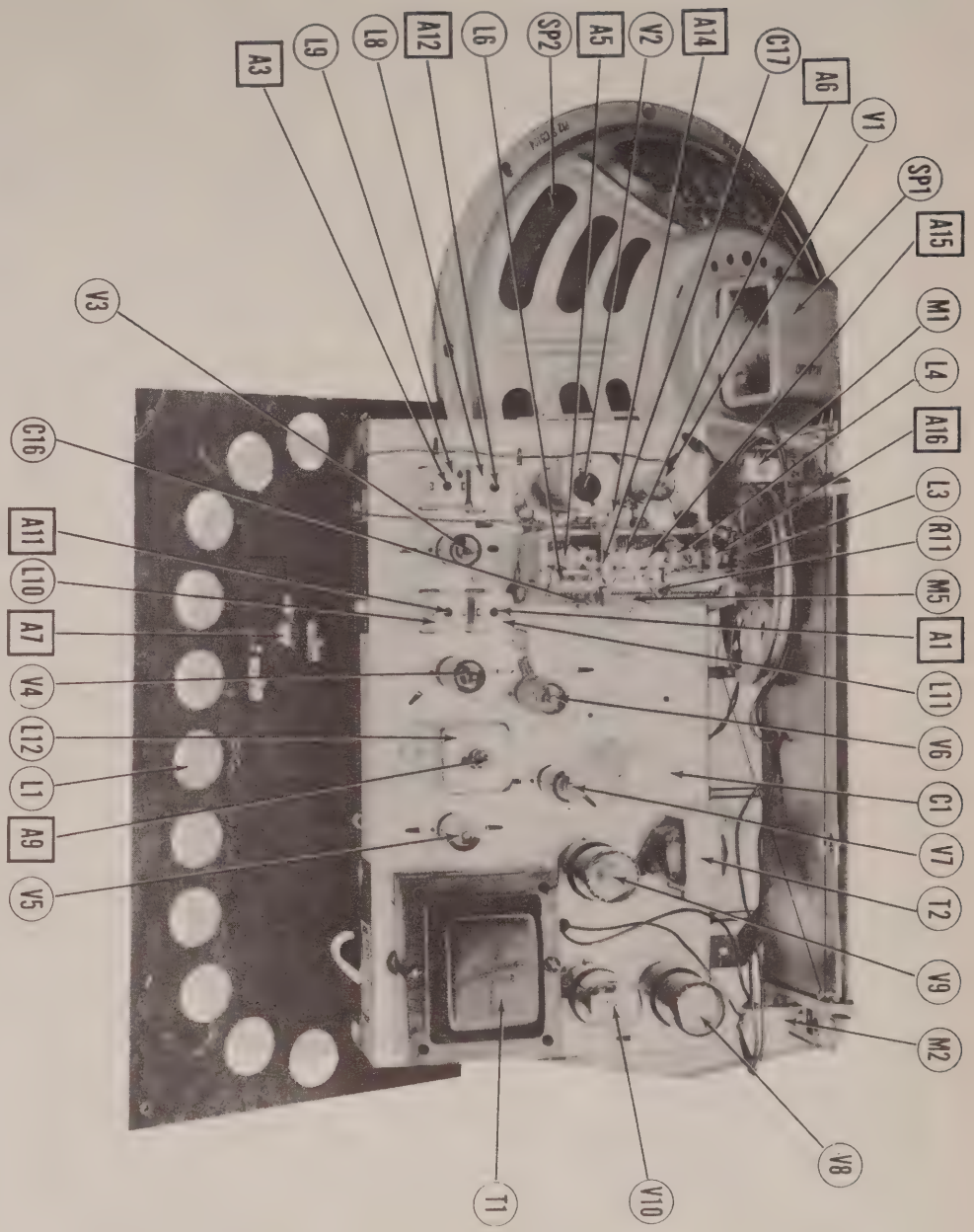
ITEM No.	RATING				REPLACEMENT DATA			
	PRI.	SEC. 1	SEC. 2	SEC. 3	CORONADO PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.
T1	117VAC @ .7A	660VCT .087A DC	5VAC @ 2A	6.3VAC @ 3.5A	53X286	P-6013#	P-2953#	PH-90#

Drill New Mounting Holes.

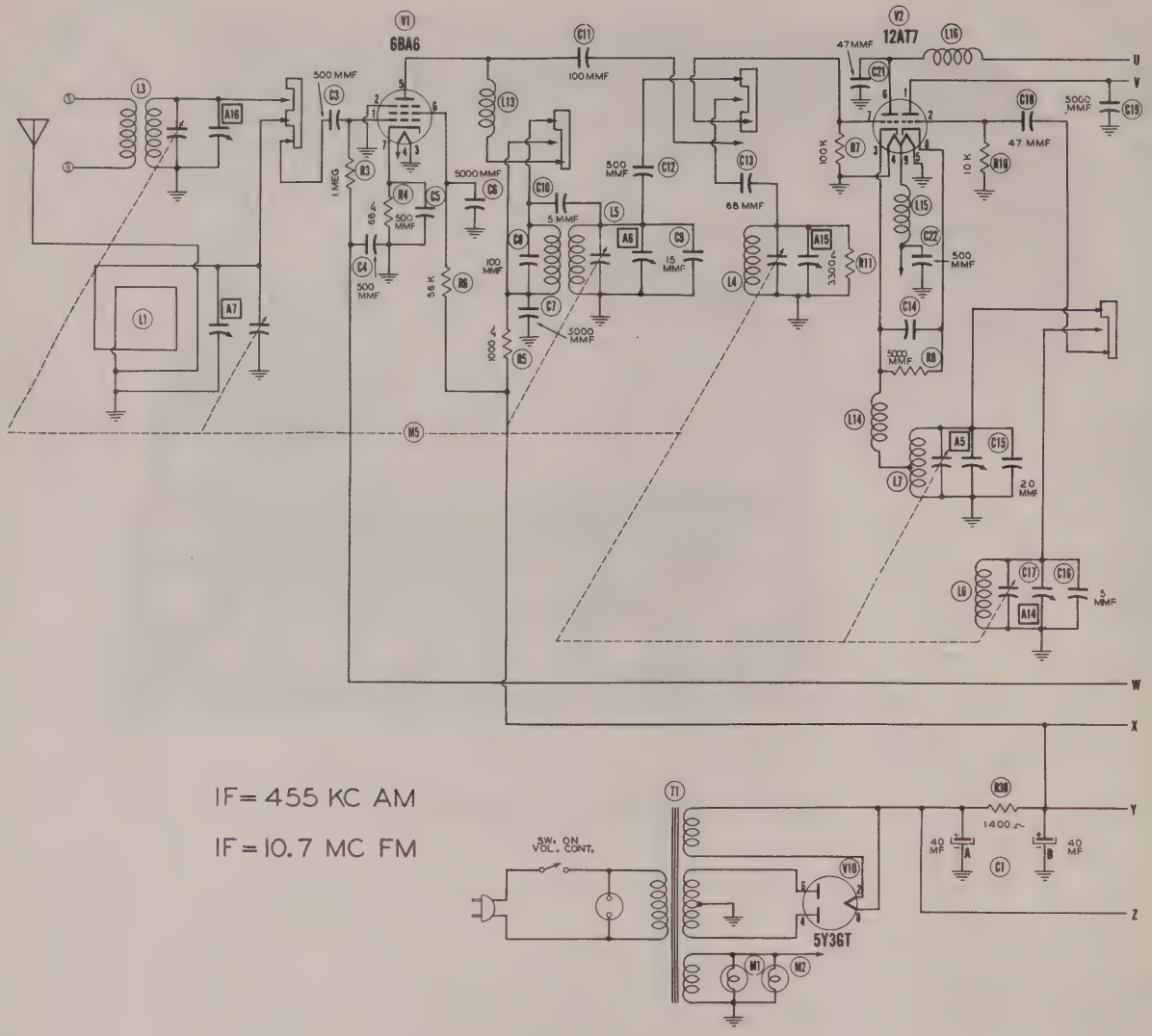
TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA				INSTALLATION NOTES
	IMPEDANCE		DC RES.		CORONADO PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
	PRI.	SEC.	PRI.	SEC.					
T2	8.3KΩ CT	3.6Ω	750Ω CT	1.5Ω	51X142	A-3823	A-2936	RO-110	

CHASSIS—BOTTOM VIEW



DATE 10/49 SES # 272 FOLDER #2



VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6BA6	0V	0V	0V	6.5VAC	240VDC	75VDC	.75VDC		
V2A	12AT7	230VDC	§-6.5VDC	.1VDC	0V	0V	230VDC	0V	4.5VDC	6.3VAC
‡V2B	12AT7	230VDC	§-.2VDC	.1VDC	0V	0V	230VDC	0V	3.9VDC	6.3VAC
V3	6BA6	0V	0V	0V	6.5VAC	245VDC	68VDC	.8VDC		
‡V4	6BA6	0V	0V	0V	6.5VAC	230VDC	87VDC	1VDC		
‡V5	6AL5	0V	0V	0V	6.5VAC	.25VDC	0V	-.25VDC		
V6	6AV6	-.75VDC	0V	0V	6.5VAC	0V	-1.5VDC	112VDC		
V7	6AV6	-.6VDC	0V	0V	6.5VAC	0V	0V	105VDC		
V8	6K6GT	105VDC	6.5VAC	320VDC	230VDC	0V	0V	0V	18VDC	
V9	6K6GT	0V	6.5VAC	320VDC	230VDC	0V	0V	0V	18VDC	
V10	5Y3GT	0V	320VDC	0V	310VAC	0V	310VAC	0V	320VDC	

§ Taken With Vacuum Tube Voltmeter.
‡ Taken In FM Position.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6BA6	2.5 Meg	0Ω	0Ω	.1Ω	†2500Ω	†60KΩ	70Ω		
V2A	12AT7	†2500Ω	10KΩ	4Ω	0Ω	0Ω	†2500Ω	100KΩ	1KΩ	.7Ω
‡V2B	12AT7	†2500Ω	10KΩ	4Ω	0Ω	0Ω	†2500Ω	100KΩ	1KΩ	.7Ω
V3	6BA6	3.7 Meg	0Ω	0Ω	.1Ω	†2500Ω	†60KΩ	70Ω		
‡V4	6BA6	.3Ω	0Ω	0Ω	.1Ω	†3500Ω	†40KΩ	70Ω		
‡V5	6AL5	Inf.	Inf.	0Ω	2.3Ω	7KΩ	0Ω	7KΩ		
V6	6AV6	10 Meg.	0Ω	0Ω	.1Ω	0Ω	500KΩ	†270KΩ		
V7	6AV6	10 Meg.	0Ω	0Ω	.1Ω	0Ω	0Ω	†270KΩ		
V8	6K6GT	†270KΩ	.1Ω	†40Ω	†1500Ω	470KΩ	Inf.	0Ω	560Ω	
V9	6K6GT	8200Ω	.1Ω	†40Ω	†1500Ω	470KΩ	.5Ω	0Ω	560Ω	
V10	5Y3GT	Inf.	80KΩ	Inf.	130Ω	Inf.	140Ω	Inf.	80KΩ	

‡ Taken In FM Position.
† Measured From Pin 8 Of V10.

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

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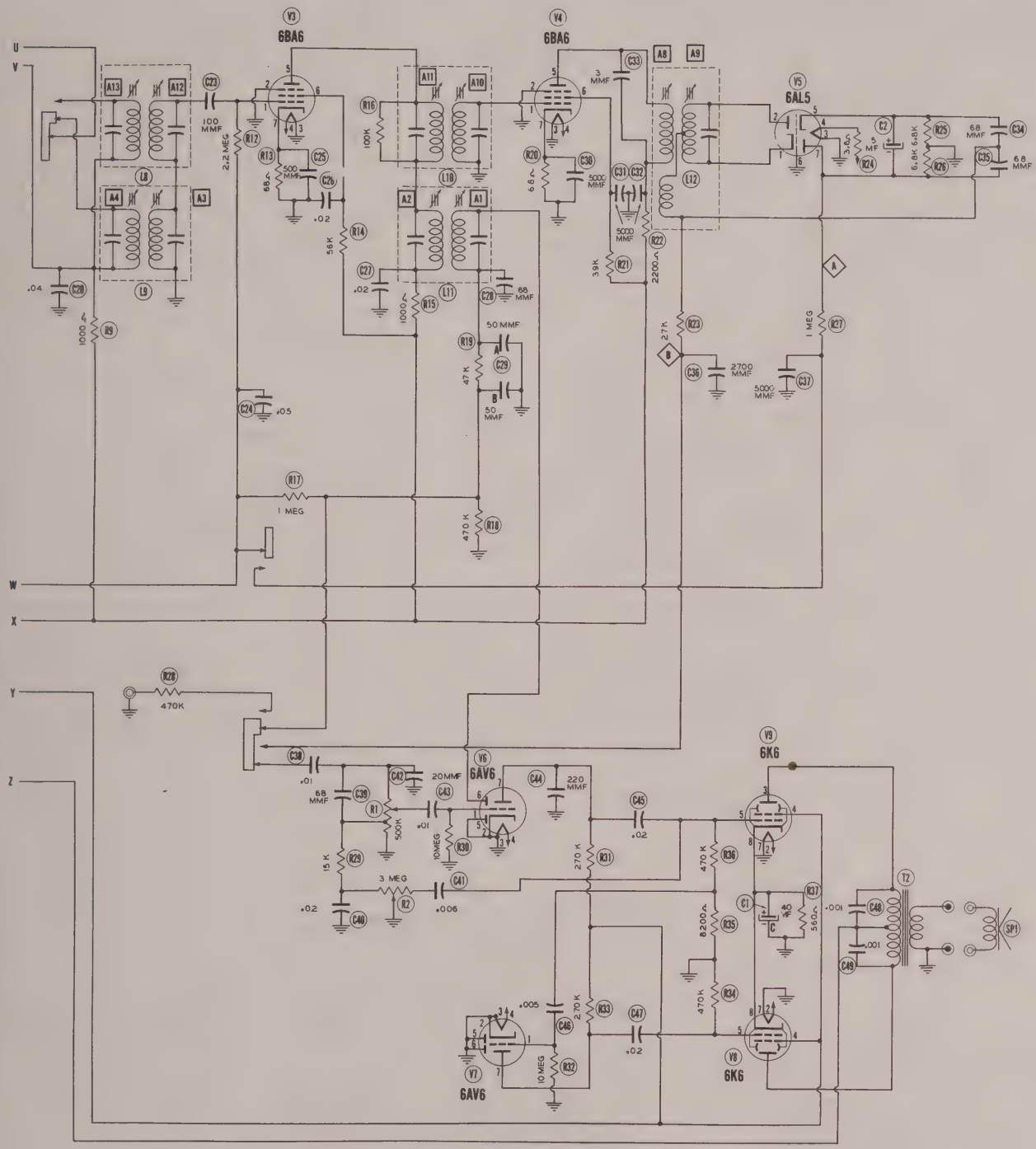

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Loop should be maintained in same relative position to chassis as when receiver is in cabinet. Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

AM ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.01MFD	High side to pin 7 (Grid) of 12AT7 (V2). Low side to chassis.	455KC (400∿ Mod.)	AM (center)	Tuning gang fully open	Across voice coil	A1,A2, A3,A4	Adjust for maximum output.
2.	200MMF	High side to external antenna terminal. Low side to chassis.	1620KC	"	"	"	A5	"
3.	200MMF	"	1400KC	"	Tune for max. output	"	A6	Adjust for maximum output. If pointer is not at 1400 on dial, move pointer to 1400.
4.		Loop	"	"	"	"	A7	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
5.	.01MFD	High side to pin 1 (Grid) of 6BA6 (V4). Low side to chassis.	10.7MC (Unmod.)	FM (max. clockwise)	Tuning gang fully open	DC Probe to Point (A) Common to chassis.	A8	Adjust for maximum deflection.
6.	.01MFD	"	"	"	"	DC Probe to Point (B) Common to chassis.	A9	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
7.	.01MFD	High side to pin 1 (Grid) of 6BA6 (V3). Low side to chassis.	"	"	"	DC Probe to Point (A) Common to chassis.	A10, A11	Adjust for maximum deflection.
8.	.01MFD	High side to stator of FM interstage section of tuning gang. Low side to chassis.	"	"	"	"	A12, A13	Adjust for maximum deflection. Repeat steps 5 and 6 with signal generator connected as in step 8.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
5.	.01MFD	High side to pin 1 (Grid) of 6BA6 (V3). Low side to chassis.	10.7MC (450KC Sweep)	FM (ext. clockwise)	Point of non interference	Vert.Amp. to Point (A) Low side to chassis.	A8, A10, A11	Disconnect stabilizer cap C2. Adjust for maximum amplitude and symmetry as per Fig 1.
6.	.01MFD	High side to stator of FM inter stage section of tuning gang. Low side to chassis.	"	"	"	"	A12, A13	"
7.	.01MFD	"	"	"	"	Vert.Amp. to Point (B) Low side to chassis.	A8,A9	Reconnect stabilizer cap C2. Adjust A9 so 10.7MC occurs at center of crossover lines. Slightly retouch A8 for maximum amplitude and straightness of crossover lines as per Fig 2. Continue with step 9.

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
9.	300Ω carbon res.	Across antenna terminals with 300Ω in high side.	108.4MC (Unmod.)	FM	Tuning gang fully open	DC Probe to Point (A) Common to chassis.	A14	Adjust for maximum deflection.
10.	"	"	104.5MC	"	Tune for max. output.	"	A15, A16	"

FIG. 1

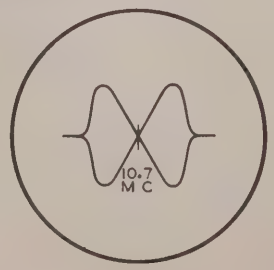

FIG. 2

DAVID BOGEN
MODEL PH10

DAVID BOGEN
MODEL PH10

DAVID BOGEN MODEL PH10

TRADE NAME	David Bogen, Model PH10
MANUFACTURER	David Bogen Co., Inc., 663 Broadway, New York 12, N.Y.
TYPE SET	AC Operated Audio Amplifier.
TUBES (FOUR)	Types 6SL7GT AF Amp.-Phase Inverter, (2) 6V6GT Power Output, 5Y3GT Rectifier.
POWER SUPPLY	110-120 Volts AC RATING .53 Amp. @ 117 Volts AC

CONNECTIONS

Input: The amplifier has a high impedance input. Connection is made from the radio output or phonograph pickup to the INPUT terminal by a single shielded wire using the single prong connector provided. For full output of the amplifier the input device must be capable of delivering approximately one volt across 500,000 ohms. Most crystal pick-ups, high output type magnetic pickups and most radio tuners can provide this voltage.

Output: Two voice coil output impedances, of 3.2 ohms and 8 ohms, respectively, are provided. Connections are made from COM. and the proper impedance tap directly to the speaker voice coil. Either PM speakers or speakers having their own field supply should be used.

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DATE 10/49 SET #73 FOLDER #3

PARTS LIST AND DESCRIPTIONS

DAVID BOGEN
MODEL PH10

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: DAVID BOGEN PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	AF Amp.-Phase Inverter	6SL7GT	6SL7GT	8BD	
V2	Power Output	6V6GT	6V6GT	7AC	
V3	Power Output	6V6GT	6V6GT	7AC	
V4	Rectifier	5Y3GT	5Y3GT	5T	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: DAVID BOGEN PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	10	450		AF22J	UP1145		EL-210	◓ Filter
B	10	450						▲ Filter
C2	8	450		PRS845	BR845		UT-8	Decoupling
C3	50	50		PRS50/50	BR505		TA-550	Output Cath. Bypass
C4	50	50		PRS50/50	BR505		TA-550	AF Cath. Bypass
C5	.05	400		P488-05	GT4S5		TM-15	Audio Coupling
C6	.05	400		P488-05	GT4S5		TM-15	Audio Coupling
C7	350	500		1468-00035	5W5T4	GP2K-330	1FM-335	Feedback
C8	5	500		1468-000005	5W5V5	NP0K-5	MS-55	Feedback
C9	.006	600		P688-006	GT6D6	GP2M-0056	TM-26	Tone Compensation Note
C10	.03	400		P488-03	GT4S3		TM-13	Tone Compensation
C11	.02	600		P688-02	GT6S2		TM-12	Tone Compensation
C12	.1	400		P488-1	GT4P1		TM-1	Line Filter

Note. Some Models Use .005MFD In This Application.

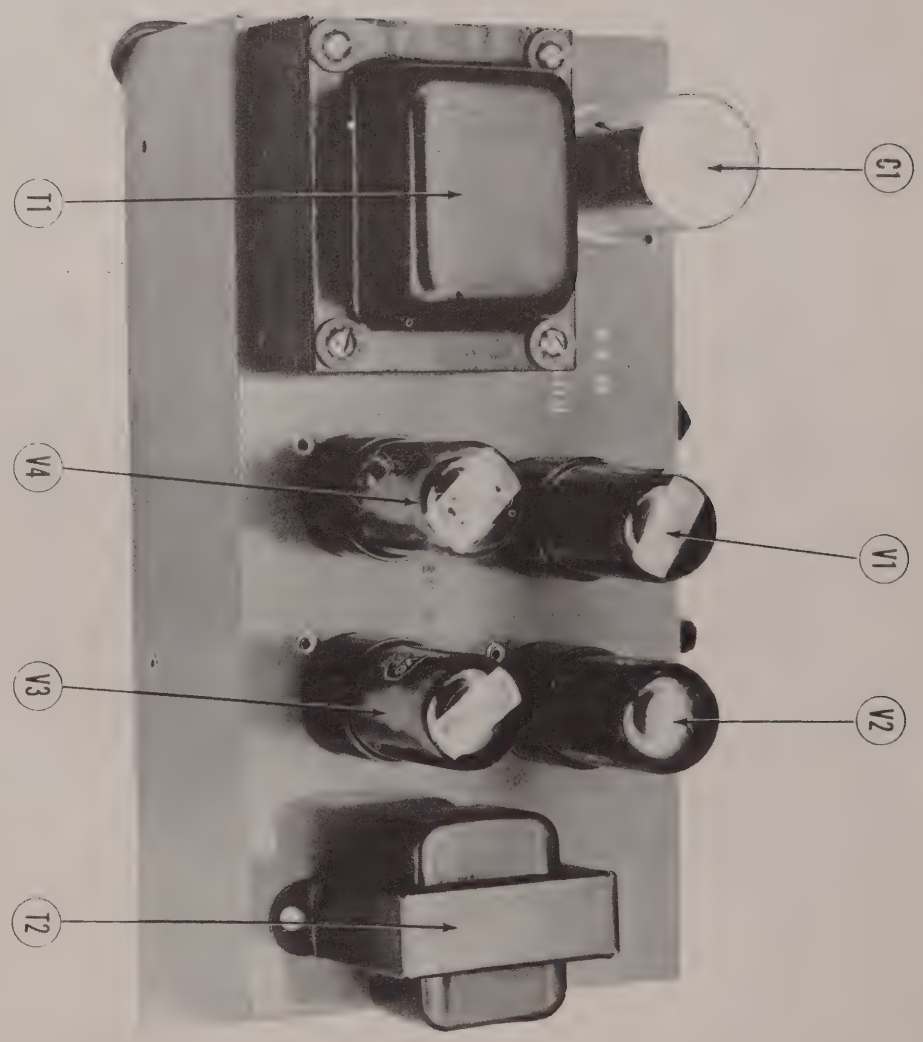
CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: DAVID BOGEN PART No.	IRC PART No.	CLAROSTAT PART No.	INSTALLATION NOTES
R1A	500KΩ	½		Q13-133	M-60-Z	Volume control
B	Switch			76-1	SW-A	Attach to R1A per instructions

RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: DAVID BOGEN PART No.	IRC PART No.	IDENTIFICATION CODES
R2	330Ω	½		BW-½-330	AF Cathode Wire Wound
R3	1000Ω	½		BTS-1000	AF Cathode
R4	3300Ω	½		BTS-3300	AF Cathode
R5	220KΩ	½		BTS-220K	AF Plate
R6	22KΩ	½		BTS-22K	Phase Inv. Grid
R7	3900Ω	½		BTS-3900	Phase Inv. Cathode
R8	220KΩ	½		BTS-220K	Phase Inv. Plate
R9	470KΩ	½		BTS-470K	Output Grid
R10	470KΩ	½		BTS-470K	Output Grid
R11	250Ω	4		AB-250	Output Cathode Wire Wound
R12	2200Ω	½		BTS-2200	Feedback
R13	100KΩ	½		BTS-100K	Feedback
R14	15KΩ	½		BTS-15K	Tone Compensation
R15	15KΩ	½		BTS-15K	Tone Compensation
R16	6800Ω	½		BTS-6800	Tone Compensation
R17	4700Ω	2		BW-2-4700	Filter
R18	500Ω	4		AB-500	Filter Wire Wound
R19	250Ω	4		AB-250	Filter

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA			
	PRI.	SEC. 1	SEC. 2	SEC. 3	DAVID BOGEN PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.
T1	117VAC @ .53A	720VCT .070A DC	5VAC @ 2A	6.3VAC @ 1.2A	T362B	P-6012	P-2952	PH-90†

† Drill New Mounting Holes.

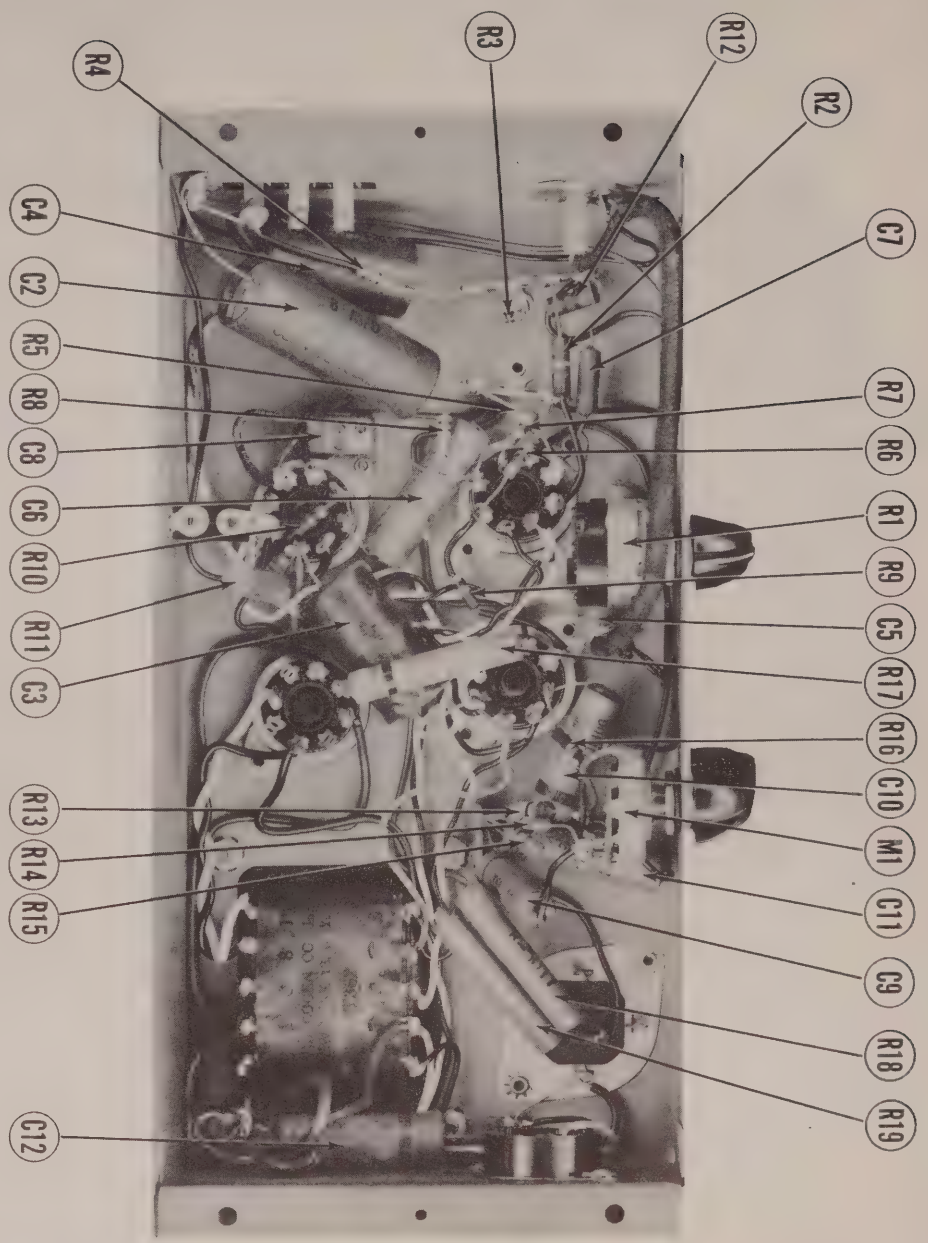
TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA				INSTALLATION NOTES
	IMPEDANCE		DC RES.		DAVID BOGEN PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
	PRI.	SEC.	PRI.	SEC.					
T2	9.2KΩ CT	3.2Ω 8Ω	390Ω CT	.3Ω .5Ω	T265BP	A-3870	A-2904‡	RO-110‡	‡ Drill One New Mtg. Hole

MISCELLANEOUS

ITEM No.	PART NAME	DAVID BOGEN PART No.	NOTES
M1	Switch		Tone

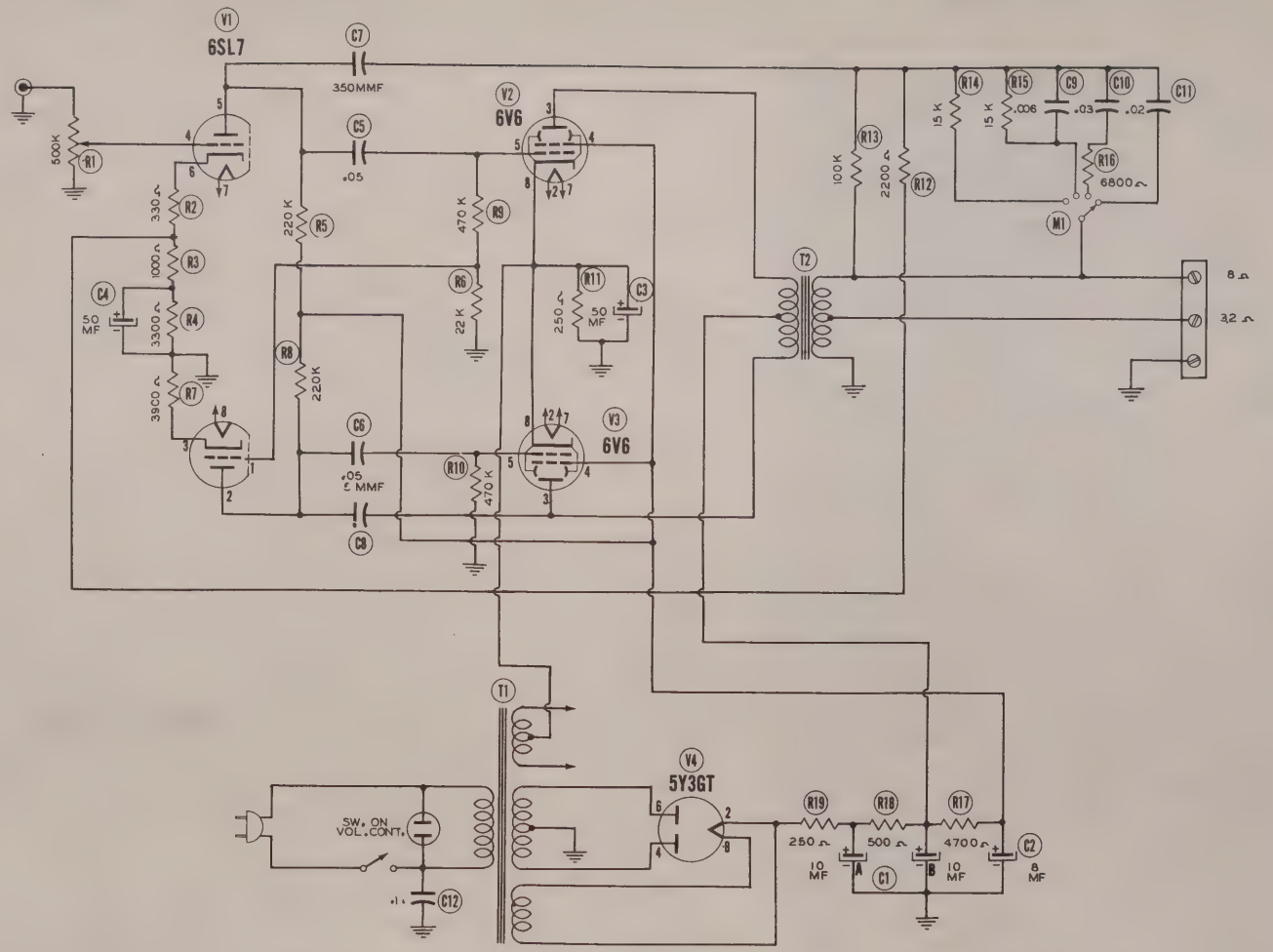
CHASSIS—BOTTOM VIEW



DAVID BOGEN MODEL PH10

DAVID BOGEN MODEL PH10

DATE 10/49 SET #73 FOLDER #3



VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	6SL7GT	0V	167VDC	2VDC	0V	167VDC	.2VDC	#17VDC	#17VDC
V 2	6V6GT	0V	#17VDC	310VDC	280VDC	.2VDC	0V	#17VDC	17VDC
V 3	6V6GT	0V	#17VDC	310VDC	280VDC	0V	0V	#17VDC	17VDC
V 4	5Y3GT	0V	375VDC	0V	360VAC	375VDC	360VAC	0V	375VDC

6.3VAC Measured Across Filament.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	6SL7GT	22KΩ	†220KΩ	4KΩ	5Ω	†220KΩ	4.5KΩ	250Ω	250Ω
V 2	6V6GT	0Ω	250Ω	†900Ω	†5.5KΩ	500KΩ	Inf.	250Ω	250Ω
V 3	6V6GT	0Ω	250Ω	†900Ω	†5.5KΩ	470KΩ	470KΩ	250Ω	250Ω
V 4	5Y3GT	Inf.	100KΩ	Inf.	150Ω	100KΩ	130Ω	Inf.	100KΩ

† Measured From Pin 8 Of V4.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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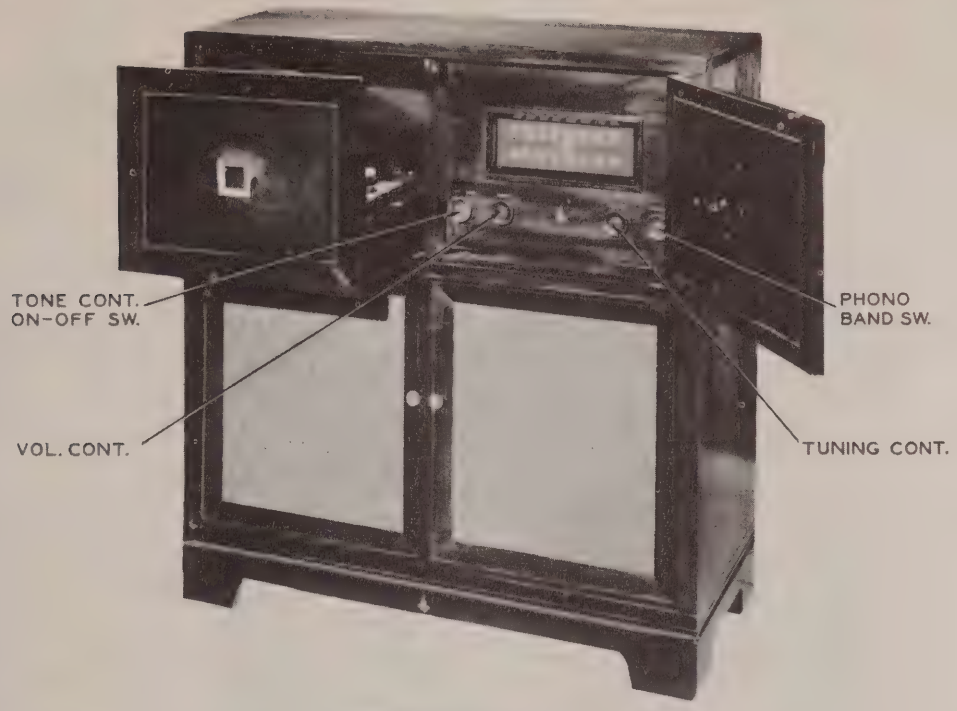
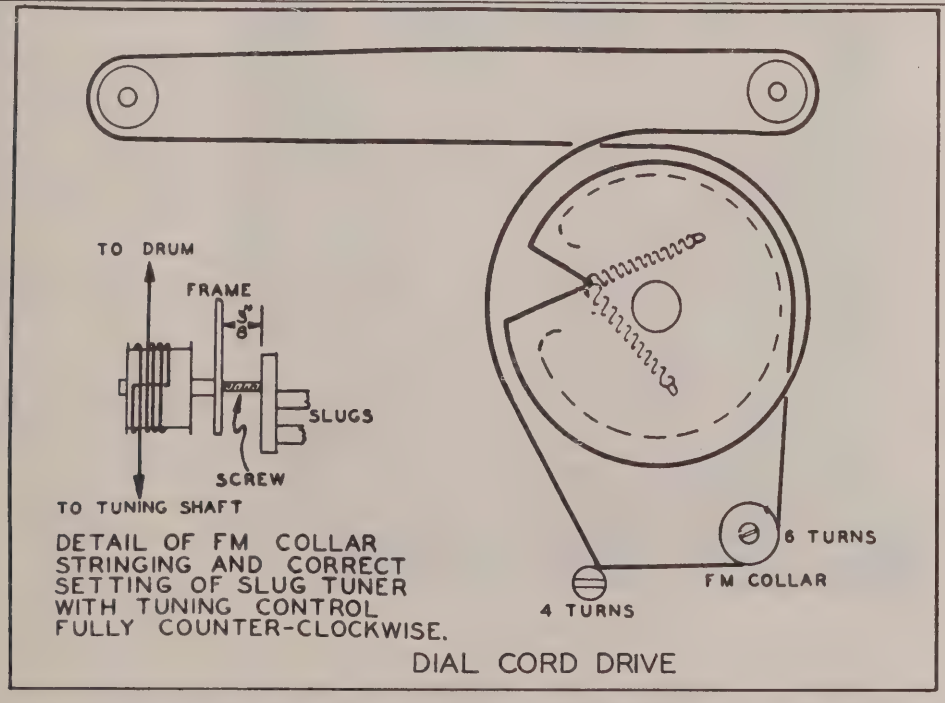
1 - DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1000 ohms per volt.
2 - Socket connections are shown as bottom views.
3 - Measured values are from socket pin to common negative.
4 - Line voltage maintained at 117 volts for voltage readings.
5 - Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6 - Volume control at minimum, proper output load connected.



EMERSON MODEL 603

TRADE NAME	Emerson, Models 563, 593, 603 (Ch. 120063B)
MANUFACTURER	Emerson Radio and Phonograph Corp., 111 8th Ave., New York 11, New York
TYPE SET	AC Operated Combination Phono-Radio, AM-FM Superheterodyne Receiver with Loop Antenna
TUBES(ELEVEN)	Types 6AG5 RF Amp., 6BE6 Converter, 6SG7 1st IF Amp., 6SG7 FM 2nd IF Amp., 6U5/6G5 Tuning Indicator, 6SH7 Limiter, 6S8GT DET-AVC-AF, 6SQ7 Phase Inverter, (2) 6V6GT Power Output, 5U4G Rectifier.
POWER SUPPLY	110-120 Volts AC — RATING: .85 Amp. @ 117 Volts AC
TUNING RANGE-BROADCAST	535-1620KC — FREQ. MOD. 88-108MC



DETAIL OF FM COLLAR STRINGING AND CORRECT SETTING OF SLUG TUNER WITH TUNING CONTROL FULLY COUNTER-CLOCKWISE.

DIAL CORD DRIVE

EMERSON MODELS
563, 593, 603 (Ch. 120063B)

EMERSON MODELS
563, 593, 603 (Ch. 120063B)

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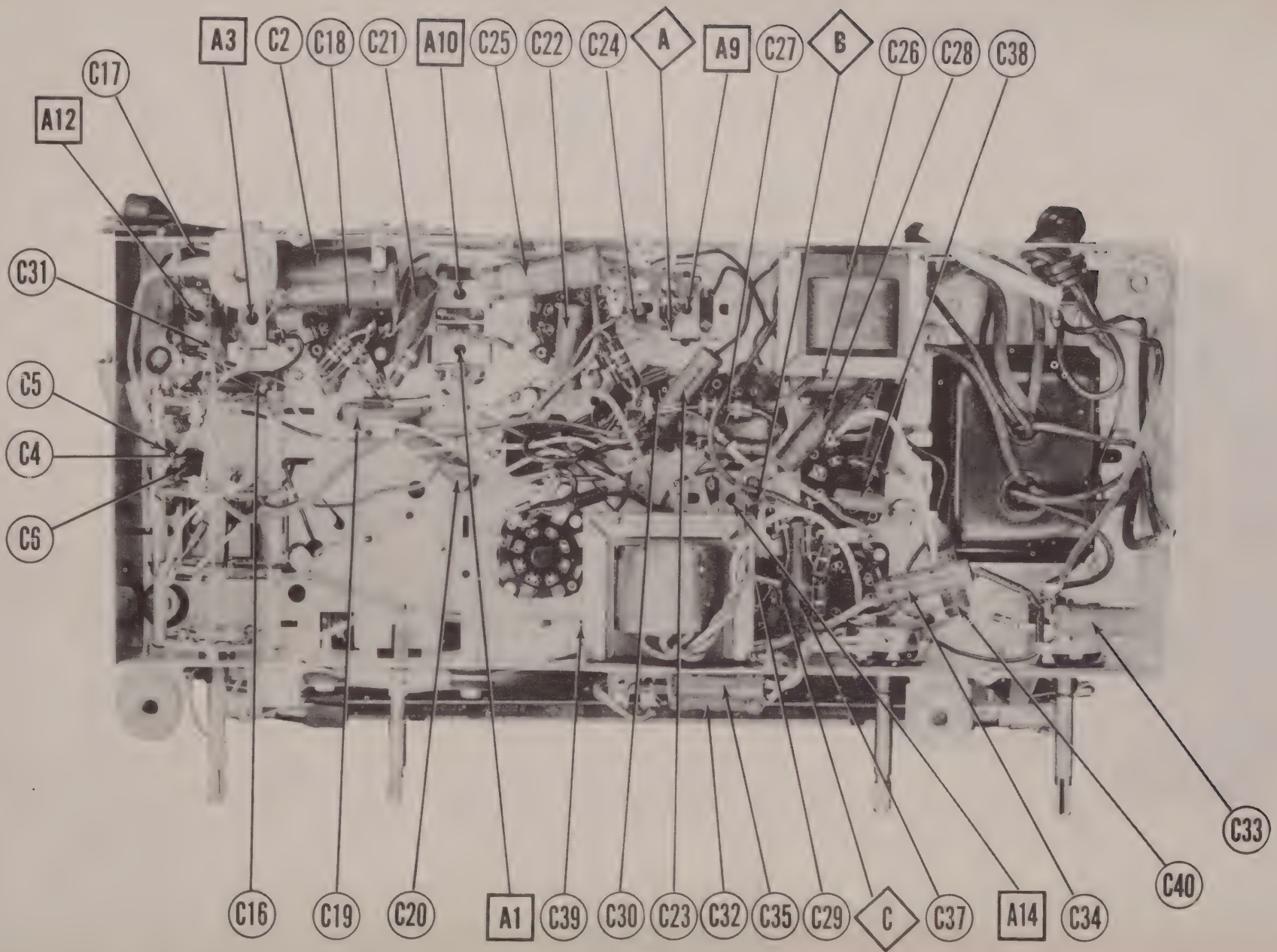
DATE 10/49 SET #73 FOLDER #4


A3
C2
C18
C21
A10
C25
C22
C24
A
A9
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B
C26
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C38
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C4
C6
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C40
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R20
R17
R14
R16
R15
R12
R40
R33
R11
L21
R4
R28
R10
M4
R13
R36
L20
R35
R31
T2
R22
R26
R32
R37
R34
R1
R30
R2

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: EMERSON PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	RF Amp.	6AG5	6AG5	7BD	
V2	Converter	6BE6	6BE6	7CH	
V3	1st IF Amp.	6SG7	6SG7	8BK	
V4	FM 2nd IF Amp.	6SG7	6SG7	8BK	
V5	Tuning Indicator	6U5/6G5	6U5/6G5	6R	
V6	Limiter	6SH7	6SH7	8BK	
V7	DET-AVC-AF	6S8GT	6S8GT	8CB	
V8	Phase Inverter	6SQ7	6SQ7	8Q	
V9	Power Output	6V6GT	6V6GT	7AC	
V10	Power Output	6V6GT	6V6GT	7AC	
V11	Rectifier	5U4G	5U4G	5T	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: EMERSON PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	40	400	925006	AF88J	UP4445		EL-240	◓ Filter
B	30	400						■ Filter
C2	8	450	925190	PRS450/8	BR845		UT-8	Decoupling Note
C3	7.5		928105					RF Coupling
C4	7.5		928105					Voltage Divider
C5	50		928102	1468-00005	5W5Q5	GP1K-50	1FM-45	Voltage Divider
C6	30		928102					RF Coupling
C7	5000		928109	1467-005	1D5D5	GP2M-005	1FM-25	RF Fil. Bypass
C8	500		915003					RF Screen Bypass
C9	500		915003					Decoupling
C10	100		928106	1468-0001	5W5T1	GP1K-100	1FM-31	RF Coupling
C11	10		928002	1469-00001	5R5Q1	NP0K-10	MS-41	Fixed Trimmer
C12	250	500	910320	1468-00025	5W5T25	GP2K-250	1FM-325	Fixed Padder
C13	25		928101	1468-000025	5W5Q25	GP1K-25	MS-425	Osc. Grid Cap
C14	50		928102	1468-00005	5W5Q5	GP1K-50	1FM-45	Conv. Fil. Bypass
C15	500		915003					Osc. Anode Bypass
C16	.01	400	920090	P488-01	GT4S1	GP2-335-01	TM-11	Decoupling
C17	.1	200	920040	P288-1	GT2P1		TM-1	AVC Filter
C18	.005	600	920180	P688-005	GT6D5	GP2M-005	TM-25	1st IF Screen Bypass
C19	.01	400	920090	P488-01	GT4S1	GP2-335-01	TM-11	1st IF Plate Dec.
C20	.01	400	920090	P488-01	GT4S1	GP2-335-01	TM-11	RF Bypass
C21	.05	200	920060	P288-05	GT2S5		TM-15	2nd IF Grid Filter
C22	.005	600	920180	P688-005	GT6D5	GP2M-005	TM-25	2nd IF Screen Bypass
C23	.01	400	920090	P488-01	GT4S1	GP2-335-01	TM-11	2nd IF Decoupling
C24	50		928102	1468-00005	5W5Q5	GP1K-50	1FM-45	Limiter Grid Filter
C25	.1	200	920040	P288-1	GT2P1		TM-1	Tuning Ind. Filter
C26	.01	400	920090	P488-01	GT4S1	GP2-335-01	TM-11	Limiter Fil. Bypass
C27	.005	400	920180	P688-005	GT6D5	GP2M-005	TM-25	Limiter Screen Bypass
C28	.01	400	920090	P488-01	GT4S1	GP2-335-01	TM-11	Limiter Plate Dec.
C29	100		928013	1468-0001	5W5T1	GP1K-100	1FM-31	RF Bypass
C30	.001	400	920514	P688-001	GT6D1	GP2L-001	TM-21	De-emphasis
C31	360	500	910120	1468-00035				Tone Compensation
C32	.01	400	920090	P488-01	GT4S1	GP2-335-01	TM-11	Audio Coupling
C33	.01	400	920090	P488-01	GT4S1	GP2-335-01	TM-11	Tone Compensation
C34	.005	600	920180	P688-005	GT6D5	GP2M-005	TM-25	Tone Compensation
C35	.01	400	920090	P488-01	GT4S1	GP2-335-01	TM-11	Audio Coupling
C36	250	500	910320	1468-00025	5W5T25	GP2K-250	1FM-325	AF Plate Bypass Note
C37	.01	400	920090	P488-01	GT4S1	GP2-335-01	TM-11	Audio Coupling
C38	250	500	910320	1468-00025	5W5T25	GP2K-250	1FM-325	Output Grid Bypass Note
C39	.01	400	920090	P488-01	GT4S1	GP2-335-01	TM-11	Audio Coupling
C40	.003	600	920544	P688-003	GT6D3		TM-23	Output Plate Bypass

Note - Not Used In All Models.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: EMERSON PART No.	IRC PART No.	CLAROSTAT PART No.	INSTALLATION NOTES
R1A	1 Meg.	½	390004	Q13-137X	AT-109	Volume control, tapped @ 250KΩ
B	Shaft		Not Req.	Not Req.	KSS-3	Attach to R1A per instructions
R2	1 Meg.	½	390081			Tone control and switch

PARTS LIST AND DESCRIPTIONS (Continued)

FILTER CHOKE

ITEM No.	RATINGS: TOTAL DIRECT CURRENT	RATINGS: D. C. RESISTANCE	RATINGS: INDUCTANCE (0 CURRENT 1000 ~)	REPLACEMENT DATA: EMERSON PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	INSTALLATION NOTES
L1	.047A	405Ω	7 Henries	737002	C-1279	C-2981	R-1240	

R F COILS

ITEM No.	USE	DC RES.: PRI.	DC RES.: SEC.	REPLACEMENT DATA: EMERSON PART No.	MEISSNER PART No.
L2	Loop Ant.	.5Ω	1Ω	700003	
L3	FM Ant.Coil		0Ω	710014	
L4	Wave Trap		80Ω	708001	
L5	FM RF Coil		0Ω	713013	
L6	FM Osc.Coil		0Ω	716112	
L7	AM Osc.Coil	.5Ω	5.5Ω	716113	14-1060
L8	1st FM IF Trans.	1Ω	1Ω	720046	
L9	1st AM IF Trans.	16.5Ω	16.5Ω	720045	16-6678
L10	2nd FM IF Trans.	1Ω	1Ω	720047	
L11	2nd AM IF Trans.	17Ω	17Ω	720048	16-6678
L12	3rd FM IF Trans.	1Ω	1Ω	720049	
L13	Disc. Trans	.5Ω	1Ω	708005	
L14	RF Choke		0Ω	705003	
L15	RF Choke		1.2Ω	705000	
L16	RF Choke		.1Ω	705007	
L17	RF Choke		.2Ω	705002	
L18	RF Choke		.2Ω	705002	
L19	RF Choke		.2Ω	705002	
L20	RF Choke		.2Ω	705002	
L21	RF Choke		1Ω	705005	

DIAL LIGHTS

ITEM No.	BASE TYPE	VOLTS	AMPS.	BEAD COLOR	REPLACEMENT DATA: EMERSON PART No.	REPLACEMENT DATA:	NOTES
M1	Bayonet	6-8	.25	Blue	807020		Type #44
M2	Bayonet	6-8	.25	Blue	807020		Type #44

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA: EMERSON PART No.	REPLACEMENT DATA: ASTATIC PART No.	REMARKS
M3		L-70	

MISCELLANEOUS

ITEM No.	PART NAME	EMERSON PART No.	NOTES
M4	Switch	510018	Band
M5	2 Gang.Var.Cap	900007	(15-470MMF, 28-205MMF)
A16	Trimmer	900026	FM Osc. Adj.
A18	Trimmer	900314	FM RF Adj.
A19	Trimmer	900313	FM Ant. Adj.
	Cabinet	140144	Model 563
	Cabinet	140187	Model 593
	Cabinet	140229	Model 603
	Dial Pointer	525002	

PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		IDENTIFICATION CODES
	RESISTANCE	WATTS	EMERSON PART No.	IRC PART No.	
R3	1000Ω	½	350490	BTS-1000	FM Ant. Isolation
R4	470KΩ	½	351130	BTS-470K	RF Grid
R5	4700Ω	½	340650	BTS-4700	RF Plate Decoupling
R6	39KΩ	1	370872	BTA-39K	RF Screen Decoupling
R7	15KΩ	½		BTS-15K	Conv. Grid
R8	22KΩ	½	340810	BTS-22K	Osc. Grid
R9	18KΩ	2	397070	BT-2-18K	Osc. Plate
R10	150Ω	½	350290		Parasitic Supp.
R11	1000Ω	½	350490	BTS-1000	Filter
R12A	56KΩ	1		BTA-56K	1st IF Screen Decoupling
B	56KΩ	1		BTA-56K	1st IF Screen Decoupling
R13	1000Ω	½	350490	BTS-1000	1st IF Plate Decoupling
R14	2.2 Meg.	½	351290	BTS-2.2 Meg.	FM 2nd IF Grid
R15	27KΩ	½		BTS-27K	Diode Filter
R16	220KΩ	½	351050	BTS-220K	Diode Load
R17A	56KΩ	1		BTA-56K	FM 2nd IF Screen Decoupling
B	56KΩ	1		BTA-56K	FM 2nd IF Screen Decoupling
R18	1000Ω	½	350490	BTS-1000	FM 2nd IF Plate Decoupling
R19	1 Meg.	½	*		Tuning Ind. Plate
R20	1 Meg.	½	351210	BTS-1 Meg.	Tuning Ind. Grid
R21	47KΩ	½	340890	BTS-47K	Limiter Grid
R22	10KΩ	1	370730	BTA-10K	Voltage Divider
R23	47KΩ	1	370890	BTA-47K	Limiter Screen
R24	47KΩ	½	340890	BTS-47K	Limiter Plate
R25	100KΩ	½	340970	BTS-100K	Disc. Diode Load
R26	100KΩ	½	340970	BTS-100K	Disc. Diode Load
R27	68KΩ	½	350930	BTS-68K	De-emphasis
R28	1 Meg.	½	351210	BTS-1 Meg.	AVC Network
R29	2.2 Meg.	½	351290	BTS-2.2 Meg.	AVC Network
R30	47KΩ	½	340890	BTS-47K	Tone Compensation
R31	15 Meg.	½	397000	BTS-15 Meg.	AF Grid
R32	470KΩ	½	351130	BTS-470K	AF Plate
R33	2.2 Meg.	½	351290	BTS-2.2 Meg.	Tone Compensation
R34	220KΩ	½	351050	BTS-220K	Phase Inv. Grid
R35	1000Ω	½	350490	BTS-1000	Phase Inv. Cathode
R36	470KΩ	½	351130	BTS-470K	Phase Inv. Plate
R37	220KΩ	½	351050	BTS-220K	Output Grid
R38	220KΩ	½	351050	BTS-220K	Output Grid
R39	180Ω	2	394140	BW-2-180	Output Cathode (Wire Wound)
R40	680KΩ	½		BTS-680K	Tone Compensation

* Part Of Tuning Indicator Socket Cable Assembly. Part No. 585210.

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA			
	PRI.	SEC. 1	SEC. 2	SEC. 3	EMERSON PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.
T1	117VAC @ .85A	540VCT .12A DC	5VAC @ 3A	6.3VAC @ 3.7A	730011	P-6013†	P-2953†	PH-120†

† Add Series Resistor To Reduce Plate Voltage.

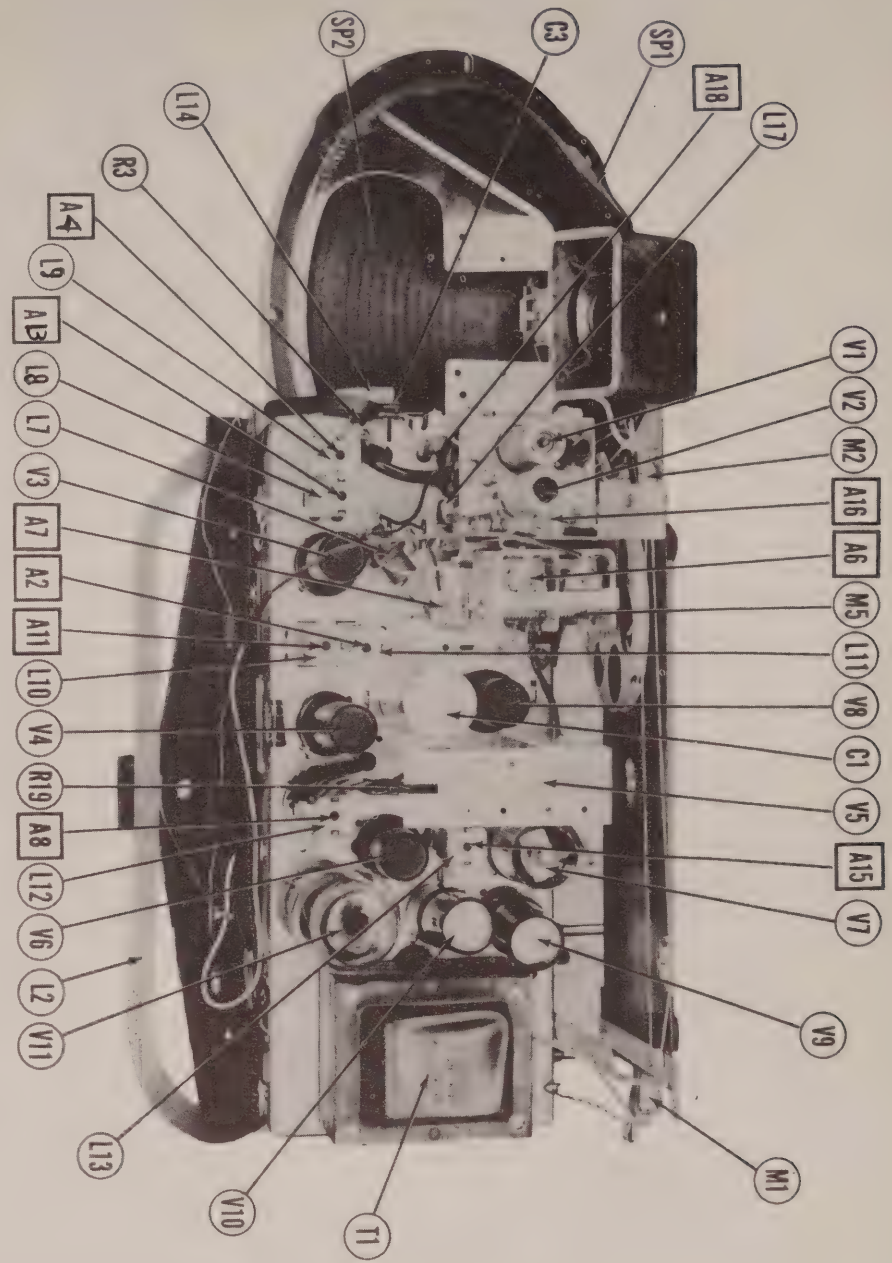
TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA				INSTALLATION NOTES
	IMPEDANCE		DC RES.		EMERSON PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
	PRI.	SEC.	PRI.	SEC.					
T2	10KΩ CT	4Ω	330Ω CT	.24Ω	734004	A-3824	A-2936	RO-110	

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA			INSTALLATION NOTES
	FIELD	V.C. IMP.	EMERSON PART No.	JENSEN PART No.	QUAM PART No.	
SP1	PM	4Ω	180023	ST-103‡ MOD.P12R	12A6A	‡ Replace Output Transformer To Match 6-8Ω Voice Coil.
	CONE DIA.	V.C. DIA.				
SP2	12"	1 1/4"				

CHASSIS—TOP VIEW



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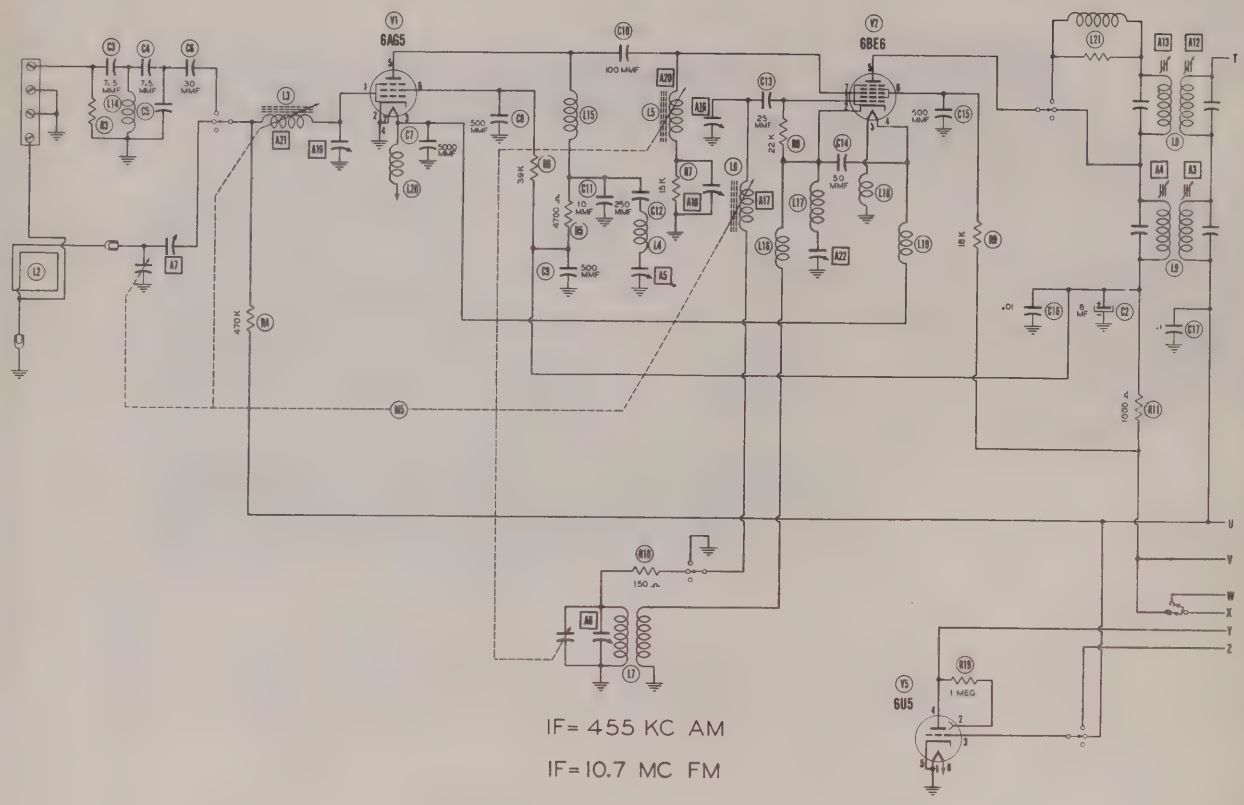

IF = 455 KC AM

IF = 10.7 MC FM

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AG5	-.5VDC	0V	6.2VAC	0V	190VDC	123VAC	0V		
V2A	6BE6	§-1VDC	0V	0V	6.1VAC	237VDC	112VDC	0V		
‡V2B	6BE6	§-.2VDC	0V	0V	6.1VAC	220VDC	106VDC	-.2VDC		
V3	6BQ7	0V	0V	0V	-.6VDC	0V	125VDC	6.3VAC	150VDC	
‡V4	6BQ7	0V	0V	0V	-.6SVDC	0V	115VDC	6.3VAC	233VDC	
V5	6U5/6G5	0V	27VDC	-.6VDC	255VDC	0V	6.3VAC			
‡V6	6SH7	0V	0V	0V	-.45VDC	0V	37VDC	6.3VAC	150VDC	
V7A	6S8GT	-.35VDC	0V	-.3VDC	-.3VDC	0V	90VDC	0V	6.3VAC	-.5VDC
‡V7B	6S8GT	-.35VDC	0V	-.75VDC	-.3VDC	-.3VDC	90VDC	0V	6.3VAC	-.5VDC
V8	6BQ7	0V	-.25VDC	.4VDC	0V	0V	57VDC	6.3VAC	0V	
V9	6V6GT	0V	6.3VAC	255VDC	255VDC	-.1VDC	-.25VDC	0V	12VDC	
V10	6V6GT	0V	0V	255VDC	255VDC	-.1VDC	0V	6.3VAC	12VDC	
V11	5U4G	0V	265VDC	0V	280VAC	0V	280VAC	0V	265VDC	

‡ Taken In FM Position.
§ Taken With Vacuum Tube Voltmeter.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AG5	1.5 Meg	0Ω	.1Ω	0Ω	†5KΩ	†40KΩ	0Ω		
V2A	6BE6	22KΩ	.8Ω	.2Ω	.4Ω	†1500Ω	†18KΩ	15KΩ		
‡V2B	6BE6	22KΩ	.8Ω	.2Ω	.4Ω	†1500Ω	†18KΩ	15KΩ		
V3	6BQ7	0Ω	0Ω	0Ω	850KΩ	0Ω	†1500Ω	.1Ω	†1500Ω	
‡V4	6BQ7	0Ω	0Ω	0Ω	2 Meg.	0Ω	†27KΩ	.1Ω	†1500Ω	
V5	6U5/6G5	0Ω	†1 Meg.	1.3 Meg	†400Ω	0Ω	.1Ω			
‡V6	6SH7	0Ω	0Ω	0Ω	50KΩ	0Ω	†47KΩ	.1Ω	†47KΩ	
V7A	6S8GT	200KΩ	0Ω	100KΩ	100KΩ	200KΩ	†470KΩ	0Ω	.1Ω	15 Meg
‡V7B	6S8GT	200KΩ	0Ω	100KΩ	100KΩ	200KΩ	†470KΩ	0Ω	.1Ω	15 Meg
V8	6BQ7	0Ω	220KΩ	1KΩ	Inf.	Inf.	†470KΩ	.1Ω	0Ω	
V9	6V6GT	Inf.	.1Ω	†180Ω	†400Ω	440KΩ	220KΩ	0Ω	180Ω	
V10	6V6GT	Inf.	0Ω	†180Ω	†400Ω	440KΩ	Inf.	.1Ω	180Ω	
V11	5U4G	Inf.	36KΩ	Inf.	50Ω	Inf.	50Ω	Inf.	36KΩ	

‡ Taken In FM Position.
† Measured From Pin 8 Of V11.

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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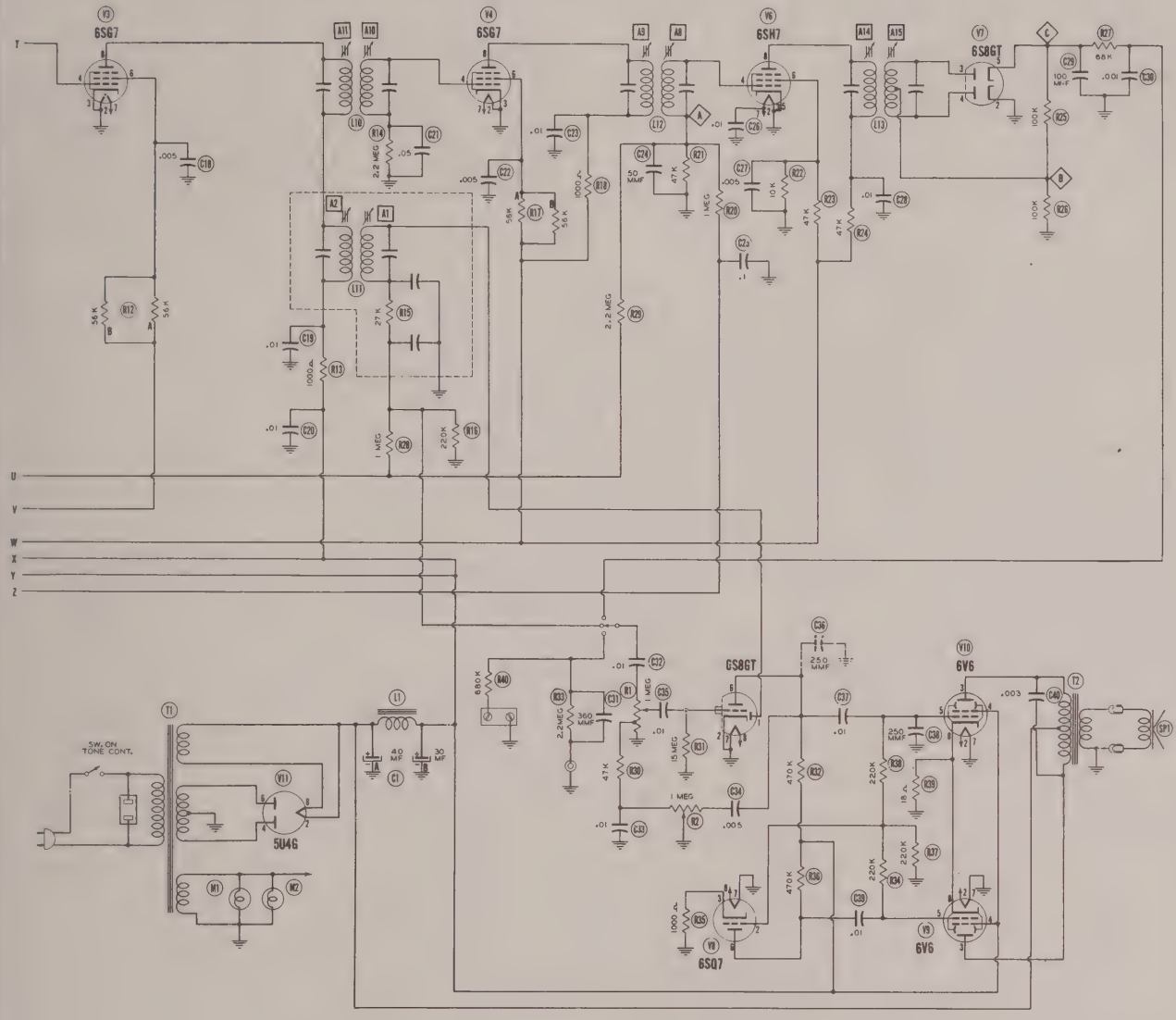

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ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Loop should be maintained in same relative position to chassis as when receiver is in cabinet.

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

To set pointer turn tuning gang fully closed and set pointer to small dots on left hand side of dial scale.

AM ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to stator of RF section of tuning gang, (front). Low side to chassis.	455KC (400∿ Mod.)	AM (center)	Tuning gang fully closed	Across voice coil	A1, A2, A3, A4	Adjust for maximum output.
2.	.1MFD	"	"	"	"	"	A5	Adjust for minimum output.
3.		Loop	1620KC (400∿ Mod.)	"	Tuning gang fully open	"	A6	Fashion lopp of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
4.		Loop	1400KC	"	Tune for max. output	"	A7	"

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
5.		High side to ungrounded tube shield floating over mixer tube (V2). Low side to chassis.	10.7MC (Unmod.)	FM (fully clockwise)	Tuning gang fully open	DC Probe to Point (A) Common to chassis.	A8, A9, A10, A11, A12, A13	Adjust for maximum deflection.
6.		"	"	"	"	DC Probe to Point (B) Common to chassis.	A14	"
7.		"	"	"	"	DC Probe to Point (C) Common to chassis.	A15	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
8.		"	"	"	"	DC Probe to Point (A) Common to chassis.	A22	Adjust for maximum deflection.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

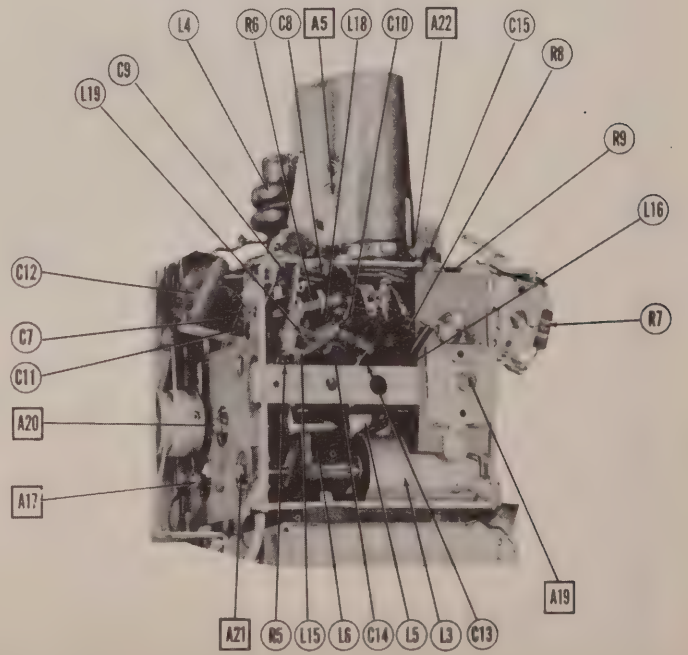
	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
5.		High side to ungrounded tube shield floating over mixer tube (V2). Low side to chassis.	10.7MC (450KC Sweep)	FM (fully clockwise)	Point of non interference	Vert. Amp. to Point (A) Low side to chassis.	A8, A9, A10, A11, A12, A13	Adjust for maximum amplitude and symmetry as per Fig 1.
6.		"	"	"	"	Vert. Amp. to Point (C) Low side to chassis.	A14, A15	Adjust A15 so 10.7MC occurs at center of crossover lines as per Fig 2. Adjust A14 for maximum amplitude and straightness of crossover lines.
7.		"	"	"	"	Vert. Amp. to Point (A) Low side to chassis.	A22	Adjust for maximum amplitude. Continue with step 9.

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
9.	Two 150Ω carbon res.	Across antenna terminals with 150Ω in each lead.	108MC (Unmod.)	FM	108MC	DC Probe to Point (A) Common to chassis.	A16	Adjust for maximum deflection.
10.	"	"	88MC	"	88MC	"	A17	Adjust iron core for max. deflection. Hold brass in position.
11.	"	"	98MC	"	98MC	"	A17	Turn screw so brass and iron turn together. Adjust for maximum deflection. Repeat steps 9, 10, and 11 until no further improvement can be made.
12.	"	"	106MC	"	106MC	"	A18, A19	Adjust for max. deflection.
13.	"	"	90MC	"	90MC	"	A20, A21	Adjust iron core for maximum deflection. Hold brass in position.
14.	"	"	100MC	"	100MC	"	A20, A21	Turn screw so brass and iron turn together. Adjust for maximum deflection. Repeat steps 12, 13, and 14 until no further improvement can be made.

FIG. 1

FIG. 2



PHOTOFACT* Folder

*TRADE MARK

FIRESTONE MODEL 13-G-4 (CODE 347-9-249B)

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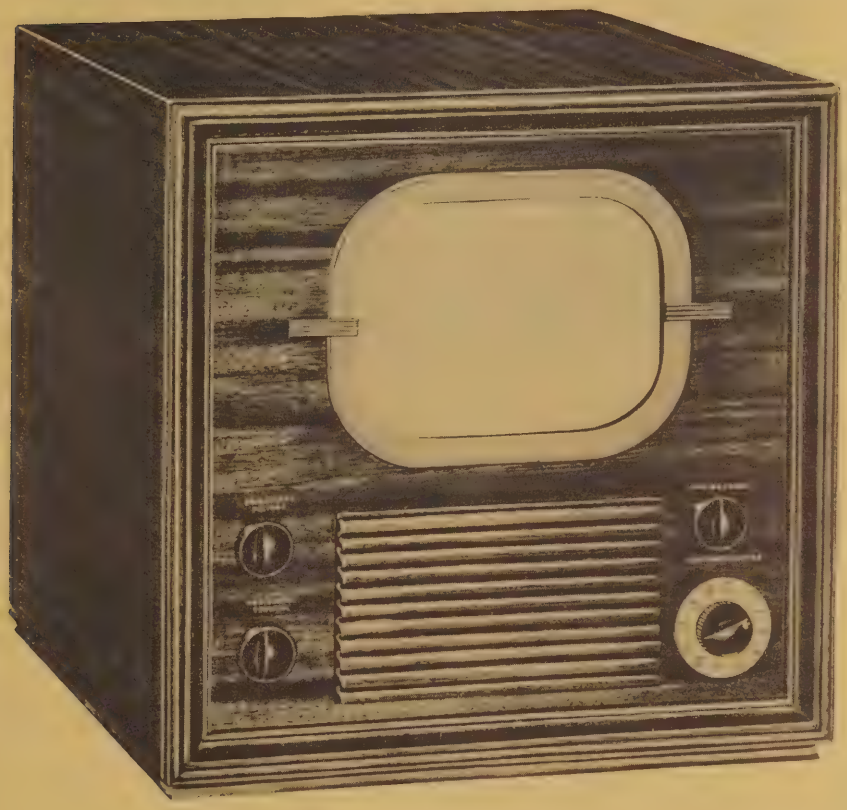

FIRESTONE MODEL 13-G-4 (CODE 347-9-249B)

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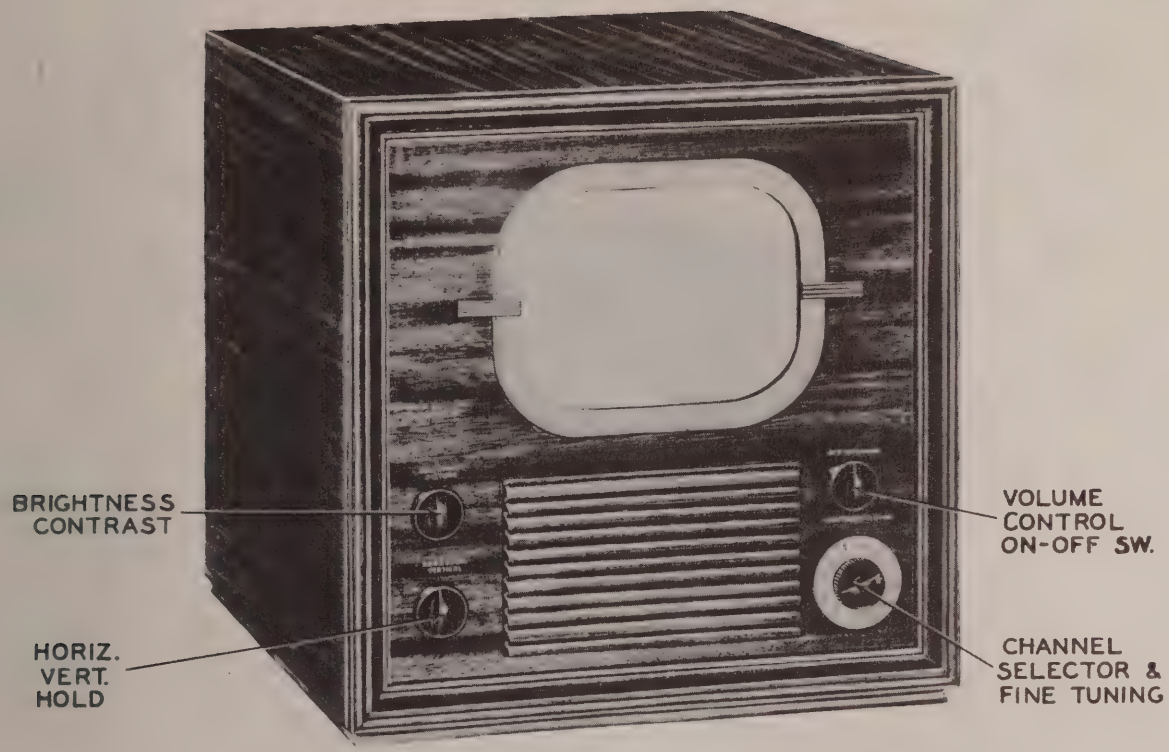

FIRESTONE
MODEL 13-G-4

TRADE NAME	Firestone, Model 13-G-4
SUPPLIER	The Firestone Tire & Rubber Co., 1200 Firestone Parkway, Akron, Ohio
TYPE SET	Television Receiver
TUBES	Twenty
POWER SUPPLY	105-125 Volts AC-60 Cycles
TUNING RANGE—Channels 2 thru 13	RATING: 1.84 Amp. @ 117 Volts AC

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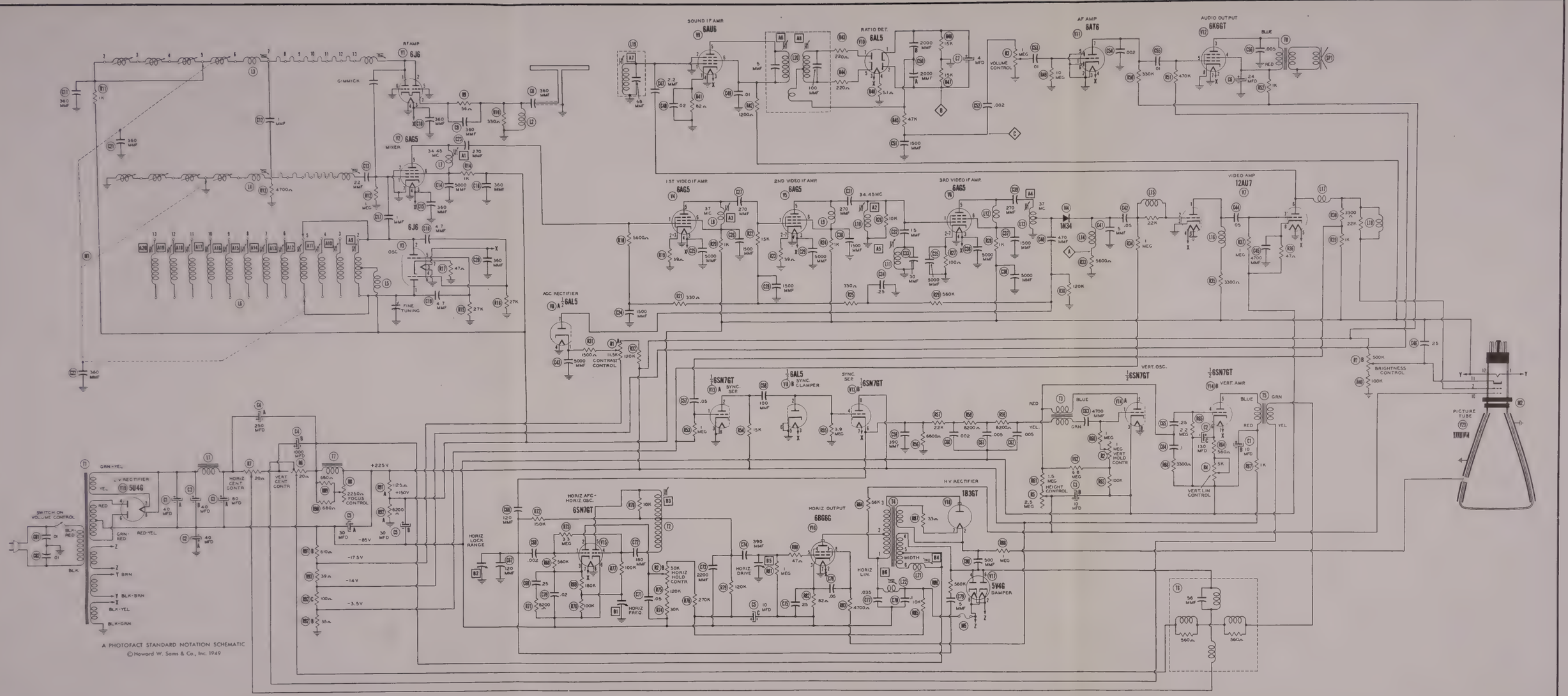
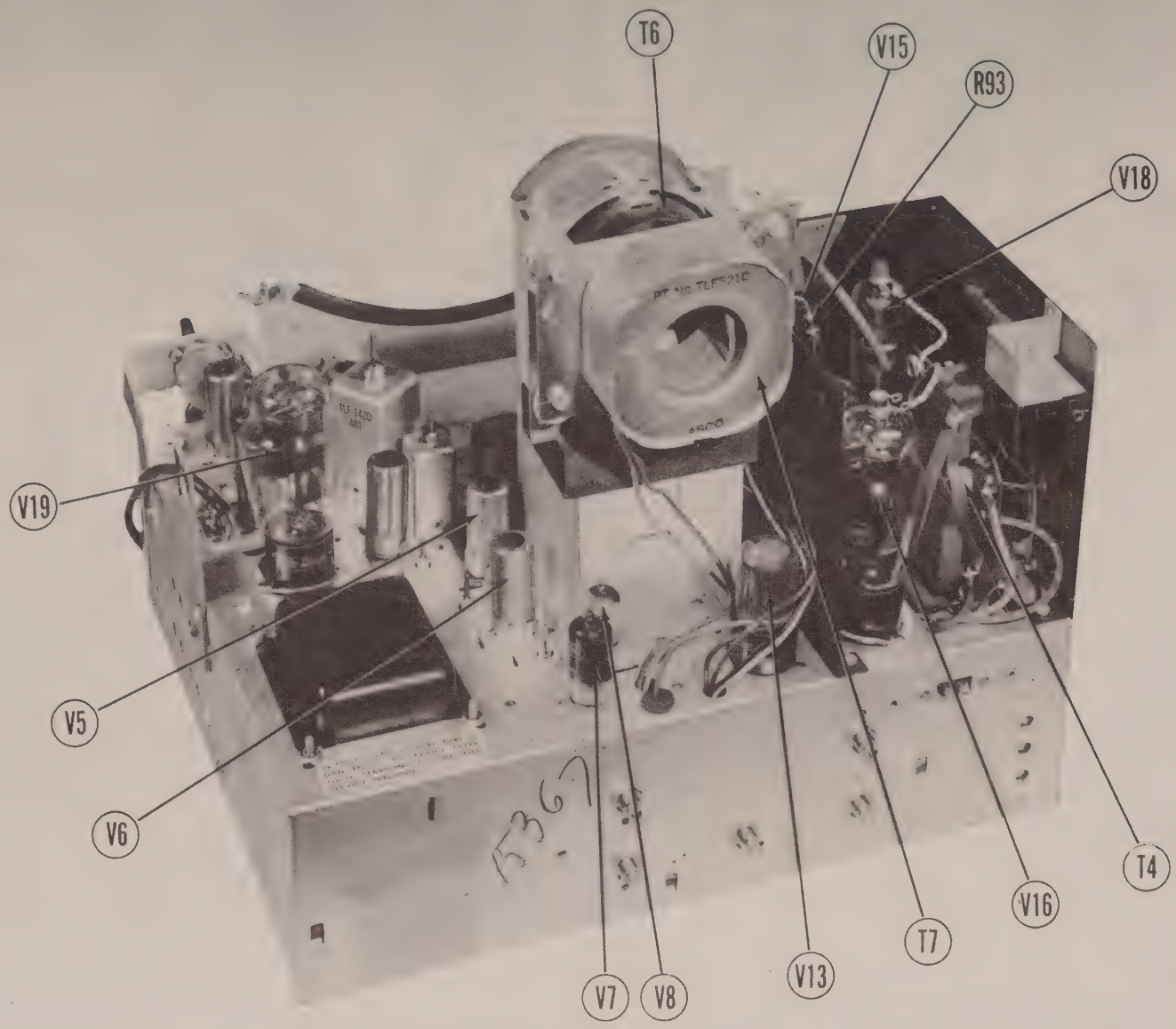
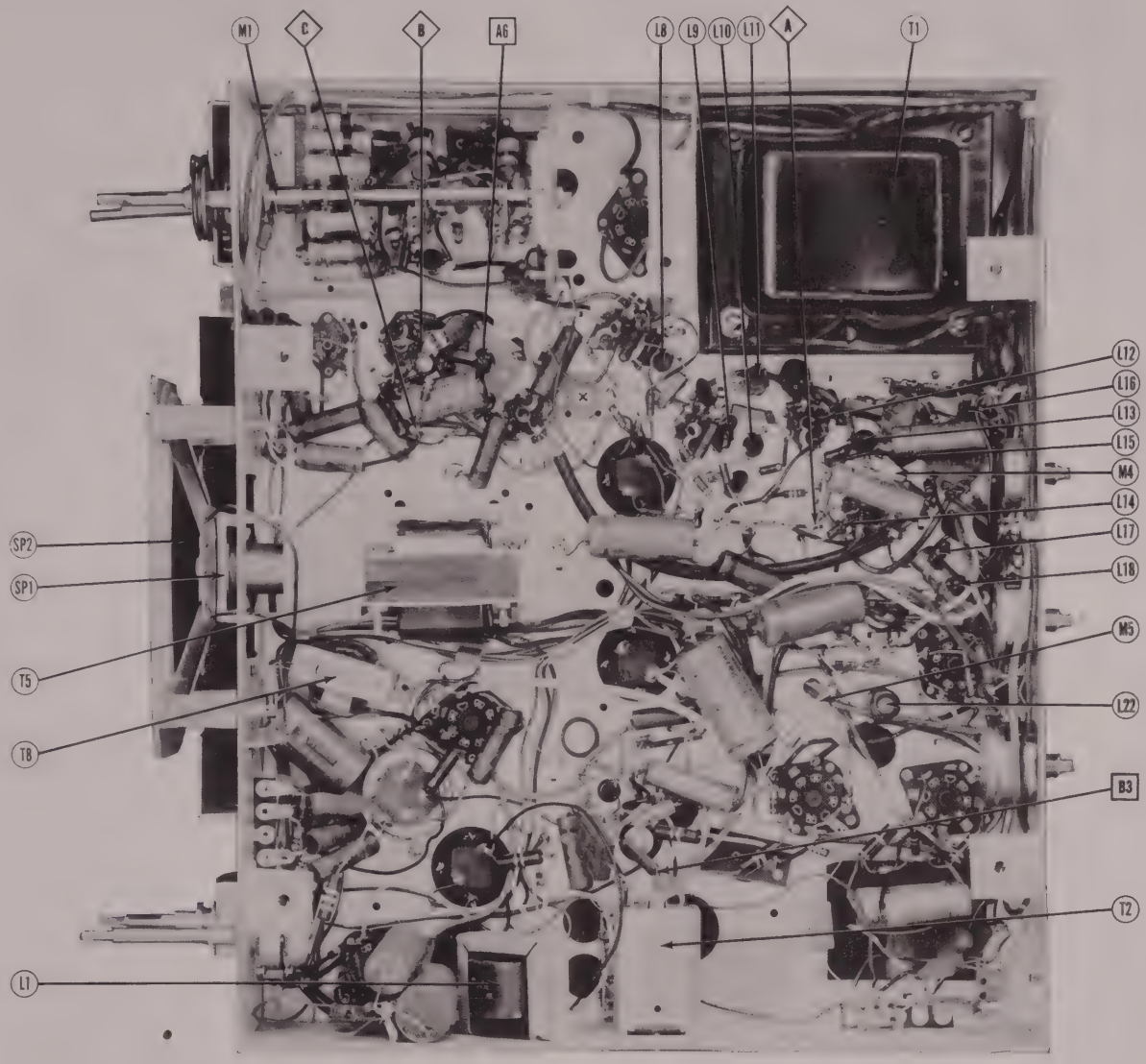
DATE 10/49 SET #73 FOLDER #5

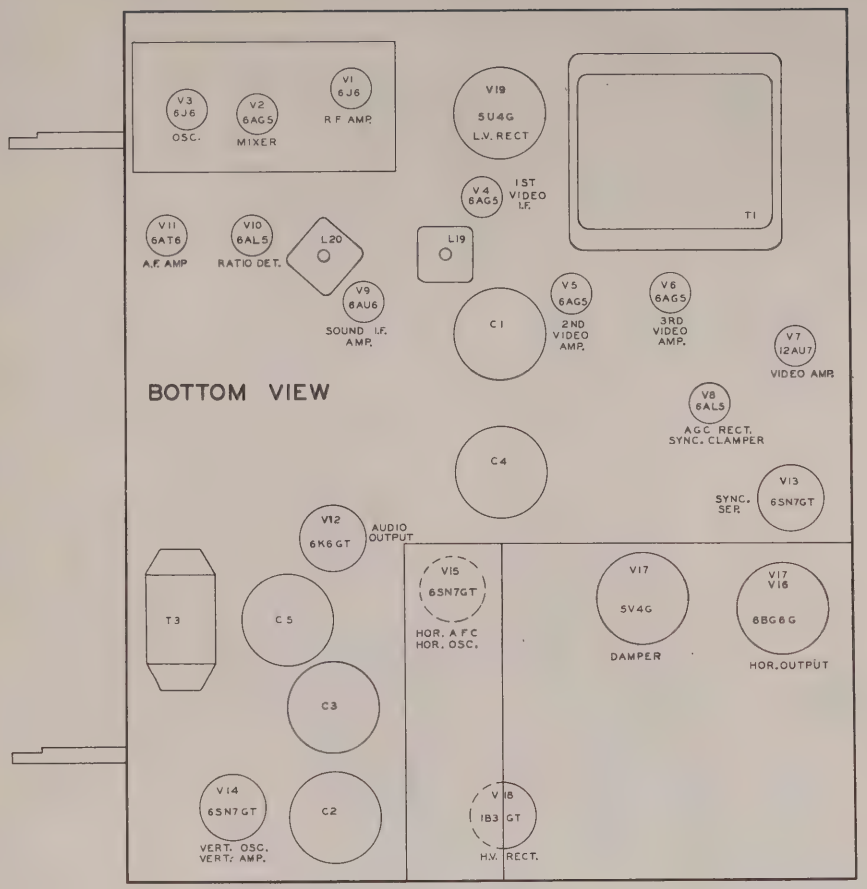

FIRESTONE
MODEL 13-G-4
SOUND IF AMP
6AU6
RATIO DET.
6AL5
AF AMP
6AT6
AUDIO OUTPUT
6K6GT
VOLUME CONTROL
RF AMP
6J6
GIMMICK
MIXER
6AG5
OSC
6J6
FINE TUNING
1ST VIDEO IF AMP.
6AG5
2ND VIDEO IF AMP.
6AG5
3RD VIDEO IF AMP.
6AG5
VIDEO AMP
12AU7
1N34
AGC RECTIFIER
½6AL5
CONTRAST CONTROL
½6SN7GT
SYNC. SEP.
½6AL5
SYNC. CLAMPER
½6SN7GT
SYNC. SEP.
VERT. OSC.
½6SN7GT
½6SN7GT
VERT. AMP.
HEIGHT CONTROL
VERT. LIN CONTROL
VERT. HOLD CONTR
BRIGHTNESS CONTROL
PICTURE TUBE
Y72
10BP4
HORIZ AFC-HORIZ OSC.
6SN7GT
HORIZ OUTPUT
6BG6G
H.V. RECTIFIER
1B3GT
5V4G
DAMPER
HORIZ LOCK RANGE
HORIZ HOLD CONTR
HORIZ FREQ.
HORIZ DRIVE
HORIZ LIN.
WIDTH
HORIZ CENT CONTR
VERT CENT CONTR
FOCUS CONTROL
5U4G
H.V. RECTIFIER
SWITCH ON VOLUME CONTROL
+225V
+150V
-17.5V
-14V
-3.5V
-85V
A PHOTOFACT STANDARD NOTATION SCHEMATIC
©Howard W. Sams & Co., Inc. 1949

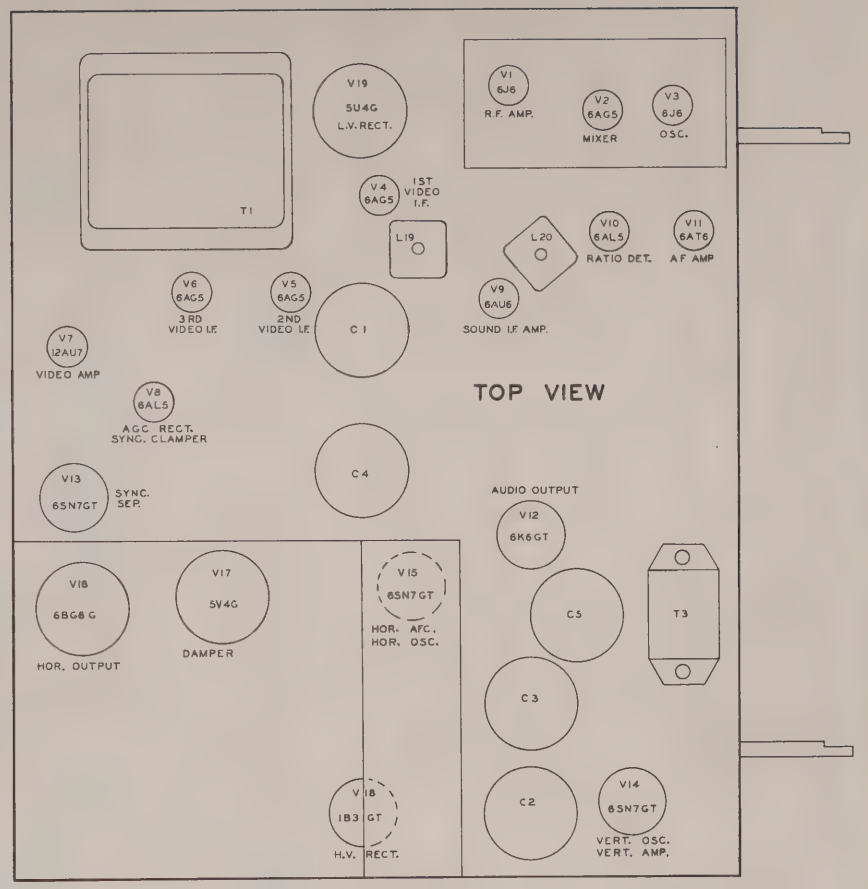


CHASSIS TOP VIEW



CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION





TUBE PLACEMENT CHART

ALIGNMENT INSTRUCTIONS

PRE-ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Removal of the horizontal oscillator tube V15 will remove high voltage shock hazard.

VIDEO IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Remove local oscillator tube V3 to prevent erroneous indications.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	Direct	High side to ungrounded tube shield floating over mixer tube (V2). Low side to chassis.	34.45MC (Unmod.)	Any	DC Probe to Point (A) Common to chassis.	A1,A2	Adjust for maximum deflection.
2.	Direct	"	37MC	"	"	A3,A4	"
3.	Direct	"	32.8MC	"	"	A5,	Adjust for minimum deflection. Repeat step 1.

OVERALL VIDEO IF RESPONSE CHECK

Connect the synchronized sweep voltage from the signal generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
4.	Direct	High side to ungrounded tube shield floating over mixer tube (V2). Low side to chassis.	36MC (10MC Sweep)	37.3MC 37MC 34.45MC 32.8MC	Any	Vert. Amp. to Point (A) Low side to chassis.		Check for response curve as per Fig 1 with markers as shown. If necessary slightly retouch A1, A2, A3, A4 for optimum results.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
5.	.01MFD	High side to pin 7 (Grid) of 12AU7 (V7). Low side to chassis.	4.5MC (Unmod.)	Any	DC Probe to Point (B) Common to chassis.	A6,A7	Adjust for maximum deflection.
6.	.01MFD	"	"	"	DC Probe to Point (C) Common to chassis.	A8	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60% modulation and 450KC sweep. Use 120% sawtooth voltage in scope for horizontalldeflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
5.	.01MFD	High side to pin 7 (Grid) of 12AU7 (V7). Low side to chassis.	4.5MC (450KC Sweep)	4.5MC	Any	Vert. Amp. to Point (B) Low side to chassis.	A6,A7	Adjust for maximum amplitude and symmetry as per Fig 2.
6.	.01MFD	"	"	"	"	Vert. Amp. to Point (C) Low side to chassis.	A8	Adjust A8 so 4.5MC marker occurs at center of crossover lines as per Fig 3. Slightly retouch A6 for maximum amplitude and straightness of crossover lines.

OSCILLATOR ALIGNMENT

Replace local oscillator tube V3.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
7.	Direct	Across antenna terminals.	57MC (10MC Sweep)	55.25MC 59.75MC	2	Vert. Amp. to Point (A) Low side to chassis.	A9	Adjust for response curve as per Fig 3 with markers as shown.
8.	Direct	"	63MC (10MC Sweep)	61.25MC 65.75MC	3	"	A10	Check all channels for response as per Fig 3. If necessary, turn proper adjustment for correctresponse. If proper response can not be obtained on all channels readjustment of Video IF Adjustments may be necessary.
			69MC (10MC Sweep)	67.25MC 71.75MC	4		A11	
			79MC (10MC Sweep)	77.25MC 81.75MC	5		A12	
			85MC (10MC Sweep)	83.25MC 87.75MC	6		A13	
			177MC (10MC Sweep)	175.25MC 179.75MC	7		A14	
			183MC (10MC Sweep)	181.25MC 185.75MC	8		A15	
			189MC (10MC Sweep)	187.25MC 191.75MC	9		A16	
			195MC (10MC Sweep)	193.25MC 197.75MC	10		A17	
			201MC (10MC Sweep)	199.25MC 203.75MC	11		A18	
			207MC (10MC Sweep)	205.25MC 209.75MC	12		A19	
			213MC (10MC Sweep)	211.25MC 213.75MC	13		A20	

The RF adjustments are set at the factory and are very stable and should not require adjustment in the field.

ALIGNMENT INSTRUCTIONS (CONT.)

FIG. 1

FIG. 2

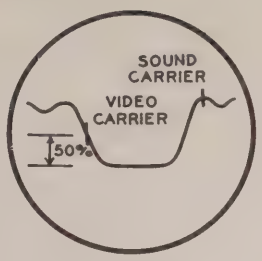
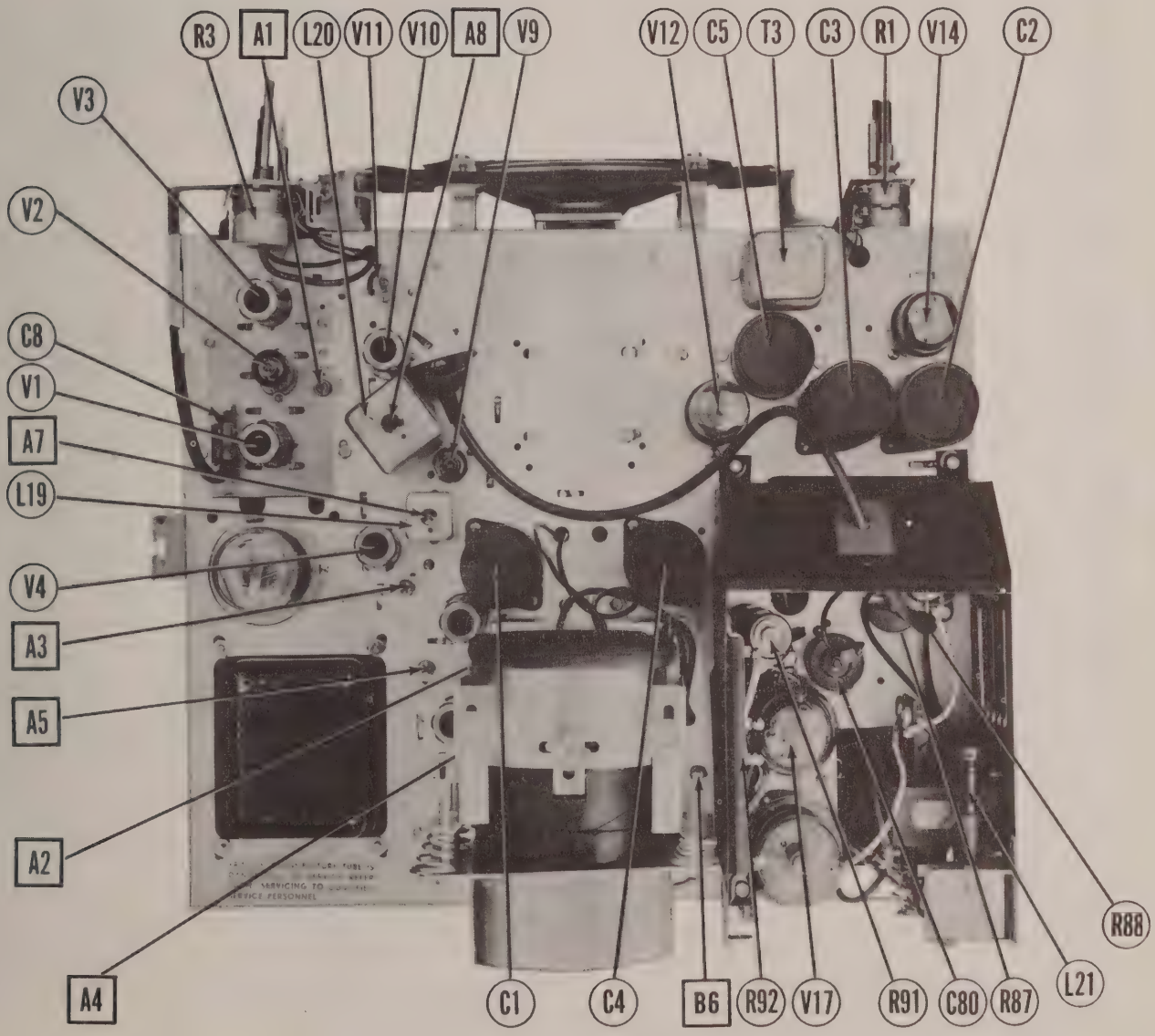


FIG. 3



CHASSIS - TOP VIEW

VOLTAGE AND RESISTANCE MEASUREMENTS

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6J6	115VDC	115VDC	6.3VAC	0V	0V	0V	.9VDC		
V 2	6AG5	-1.9VDC	0V	6.3VAC	0V	130VDC	130VDC	0V		
V 3	6J6	115VDC	115VDC	6.3VAC	0V	§-4.9 VDC	§-6.1 VDC	.4VDC		
V 4	6AG5	-1.2VDC	.3VDC	6.3VAC	0V	110VDC	110VDC	.3VDC		
V 5	6AG5	-.4VDC	.3VDC	6.3VAC	0V	110VDC	110VDC	.3VDC		
V 6	6AG5	0V	.9VDC	6.3VAC	0V	107VDC	107VDC	.9VDC		
V 7	12AU7	110VDC	-.6VDC	0V	6.3VAC	6.3VAC	♦ 140 VDC	0V	.8VDC	0V
V 8	6AL5	♦ 90VDC	-3VDC	6.3VAC	0V	0V	0V	♦ 88VDC		
V 9	6AU6	0V	0V	6.3VAC	0V	105VDC	105VDC	.7VDC		
V 10	6AL5	.2VDC	-.2VDC	6.3VAC	.6VDC	-.4VDC	0V	.1VDC		
V 11	6AT6	-.5VDC	0V	0V	6.3VAC	0V	0V	70VDC		
V 12	6K6GT	0V	6.3VAC	187VDC	200VDC	-5.2VDC	-16VDC	0V	0V	
V 13	6SN7GT	-.4VDC	145VDC	0V	-.8VDC	213VDC	3.4VDC	6.3VAC	0V	
V 14	6SN7GT	♦-14VDC	♦ 70VDC ♦ 135VDC	♦ 0V	♦ 0V	♦305VDC	♦7.5VDC ♦17VDC	6.3VAC	0V	
V 15	6SN7GT	♦-1.6VDC	♦ 105VDC	♦ 2.9VAC	♦-46VAC	♦150VDC	♦ 0V	6.3VAC	0V	
V 16	6BG6G	0V	6.3VAC	♦8.7VDC	0V	♦.8VDC	0V	0V	♦260VDC	TOP CAP *
V 17	5V4G	0V	340VDC	0V	265VDC	0V	265VDC	310VDC	340VDC	
V 18	1B3GT	* DO NOT MEASURE.								
V 19	5U4G	0V	270VDC	0V	380VAC	0V	380VAC	0V	270VDC	
V 20	12TP4	#117VDC	50VDC	PIN 10 330VDC	PIN 11 230VDC	PIN 12 #117VDC				

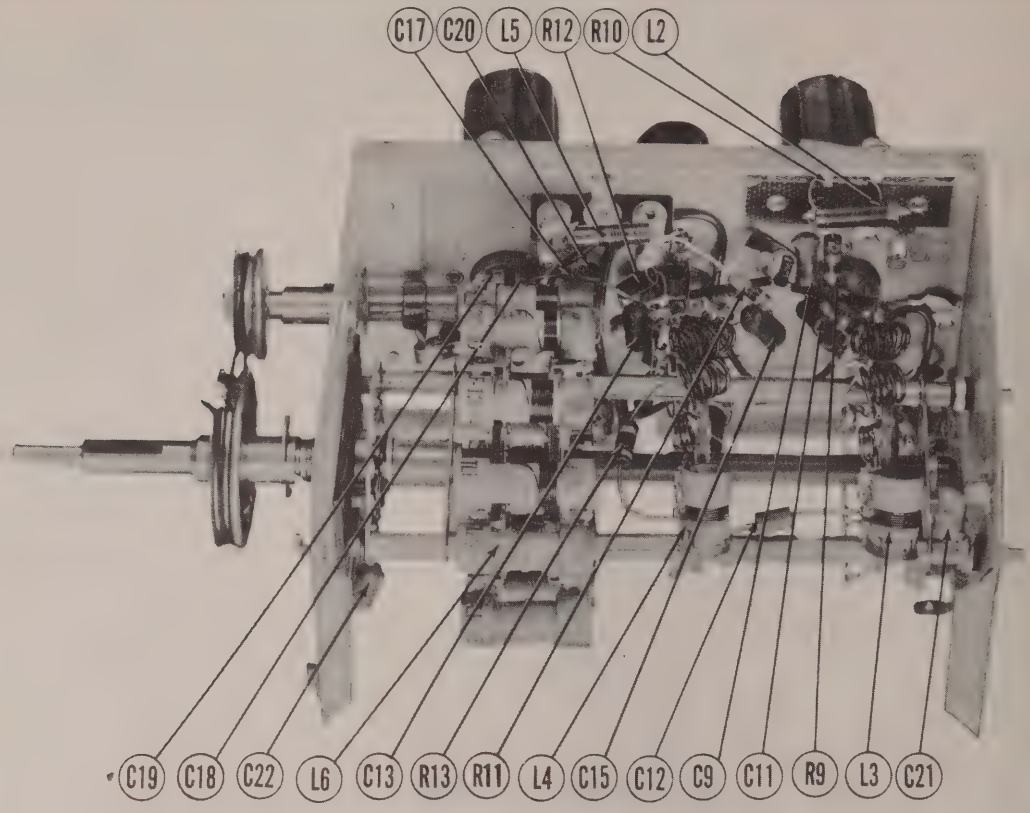
♦ Measured From Pin 6 Of V15.
6.3VAC Measured Across Filament.
Note: Contrast Control Is Set At Maximum For These Measurements.

RESISTANCE READINGS

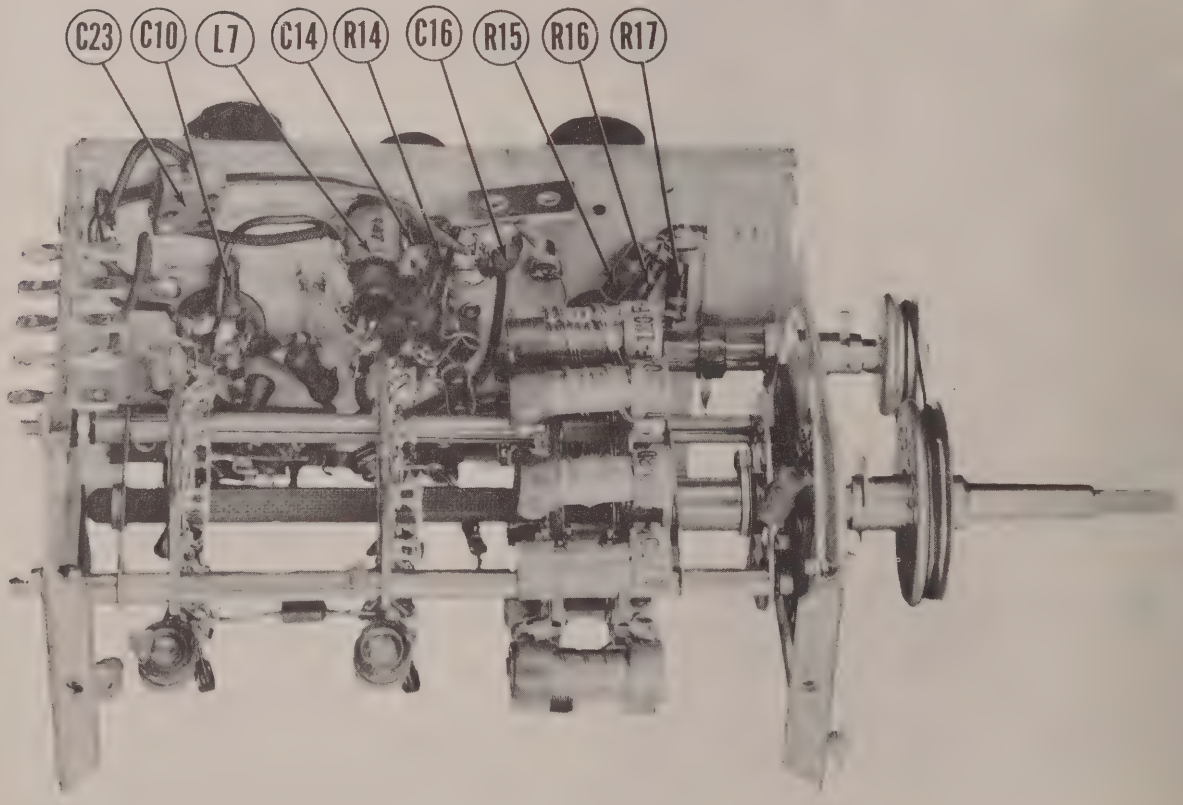
Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Fin 7	Pin 8	Pin 9
V 1	6J6	†2.5KΩ	†2.5KΩ	.1Ω	0Ω	0Ω	0Ω	56Ω		
V 2	6AG5	1 Meg.	0Ω	.1Ω	0Ω	†2.5KΩ	†2.5KΩ	0Ω		
V 3	6J6	†1.5KΩ	†1.5KΩ	.1Ω	0Ω	27KΩ	27KΩ	47Ω		
V 4	6AG5	700KΩ	39Ω	.1Ω	0Ω	†2.5KΩ	†2.5KΩ	39Ω		
V 5	6AG5	700KΩ	39Ω	.1Ω	0Ω	†2.5KΩ	†2.5KΩ	39Ω		
V 6	6AG5	.1Ω	100Ω	.1Ω	0Ω	†2.5KΩ	†2.5KΩ	100Ω		
V 7	12AU7	†4.8KΩ	1 Meg.	0Ω	.1Ω	.1Ω	†5.8KΩ	1 Meg.	♦ 47Ω	0Ω
V 8	6AL5	13KΩ 2KΩ	4 Meg.	.1Ω	0Ω	0Ω	0Ω	120KΩ		
V 9	6AU6	1.5Ω	0Ω	.1Ω	0Ω	†1.7KΩ	†1.7KΩ	82Ω		
V 10	6AL5	15KΩ	15KΩ	.1Ω	2.5Ω	Inf.	0Ω	Inf.		
V 11	6AT6	10 Meg.	0Ω	0Ω	.1Ω	0Ω	0Ω	†330KΩ		
V 12	6K6GT	Inf.	.1Ω	†2KΩ	†1.5KΩ	470KΩ	135Ω	0Ω	0Ω	
V 13	6SN7GT	1 Meg.	†15KΩ	0Ω	4 Meg.	†300Ω	6.8KΩ	.1Ω	0Ω	
V 14	6SN7GT	2.1 Meg.	♦2.5 Meg ♦1.2 Meg	780Ω	2.2 Meg	†2KΩ	♦6KΩ ♦1000Ω	.1Ω	0Ω	
V 15	6SN7GT	850KΩ	♦ 150KΩ	280KΩ	200KΩ	♦ 140KΩ	800Ω	.1Ω	0Ω	
V 16	6BG6G	Inf.	.1Ω	850Ω	Inf.	1 Meg.	Inf.	0Ω	†5KΩ	TOP CAP ♦ 210Ω
V 17	5V4G	Inf.	400KΩ	Inf.	10KΩ	Inf.	10KΩ	400KΩ	400KΩ	
V 18	1B3GT	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	TOP CAP ♦ 370Ω
V 19	5U4G	Inf.	10KΩ	Inf.	800Ω	Inf.	810Ω	Inf.	10KΩ	
V 20	12TP4	†1000Ω	†5.8KΩ	PIN 10 ♦ 56KΩ	PIN 11 † 250Ω	PIN 12 †1000Ω				

† Measured From Pin 8 Of V19.
♦ Measured From Pin 6 Of V15.
♦ Measured From Pin 8 Of V17.

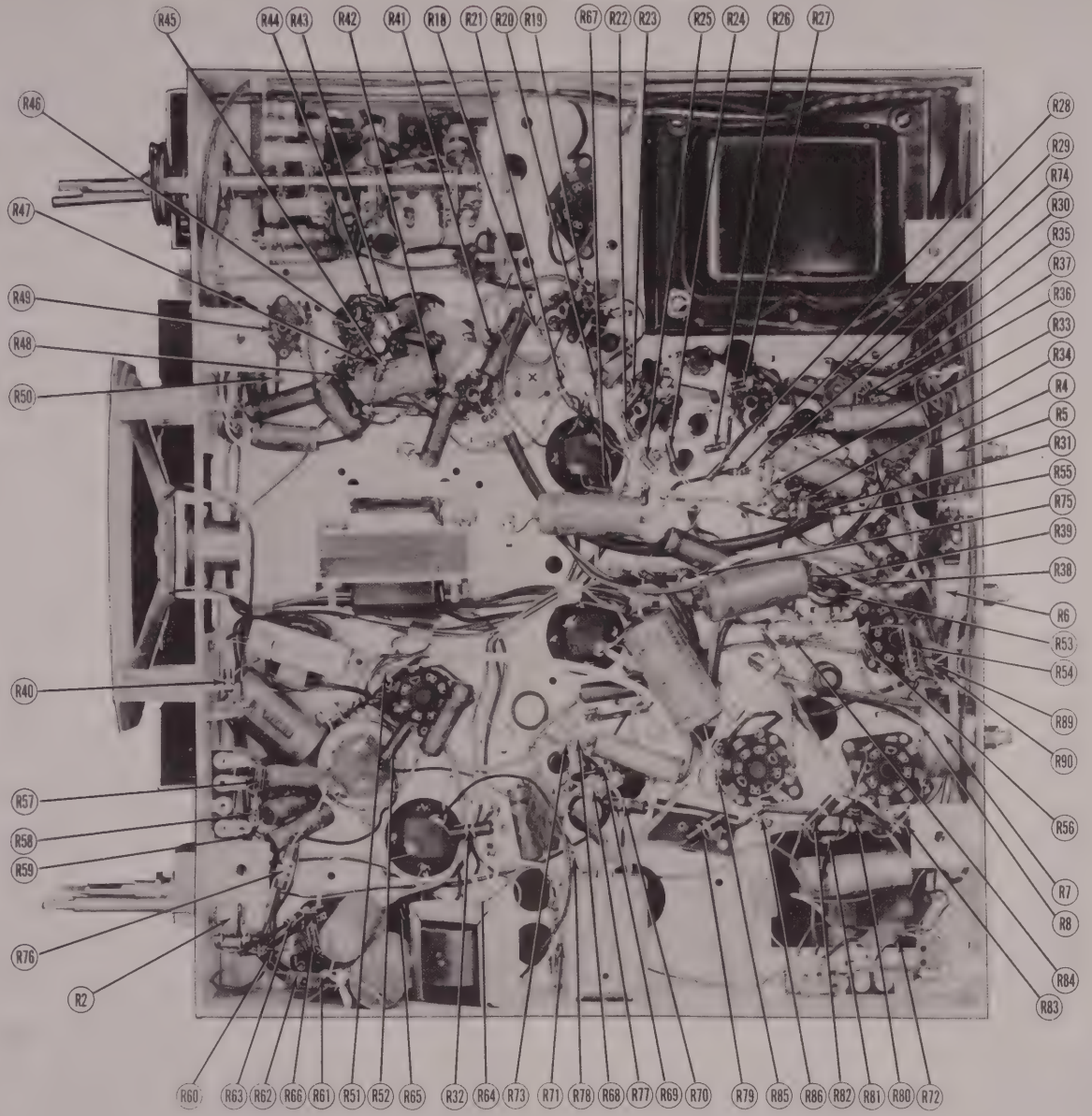
1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltage measured at 1,000 ohms.
2. Pin numbers are counted in a clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings.
5. Front panels controls set at minimum.
6. Where readings may vary according to the setting of the service controls, both minimum and maximum readings are given.



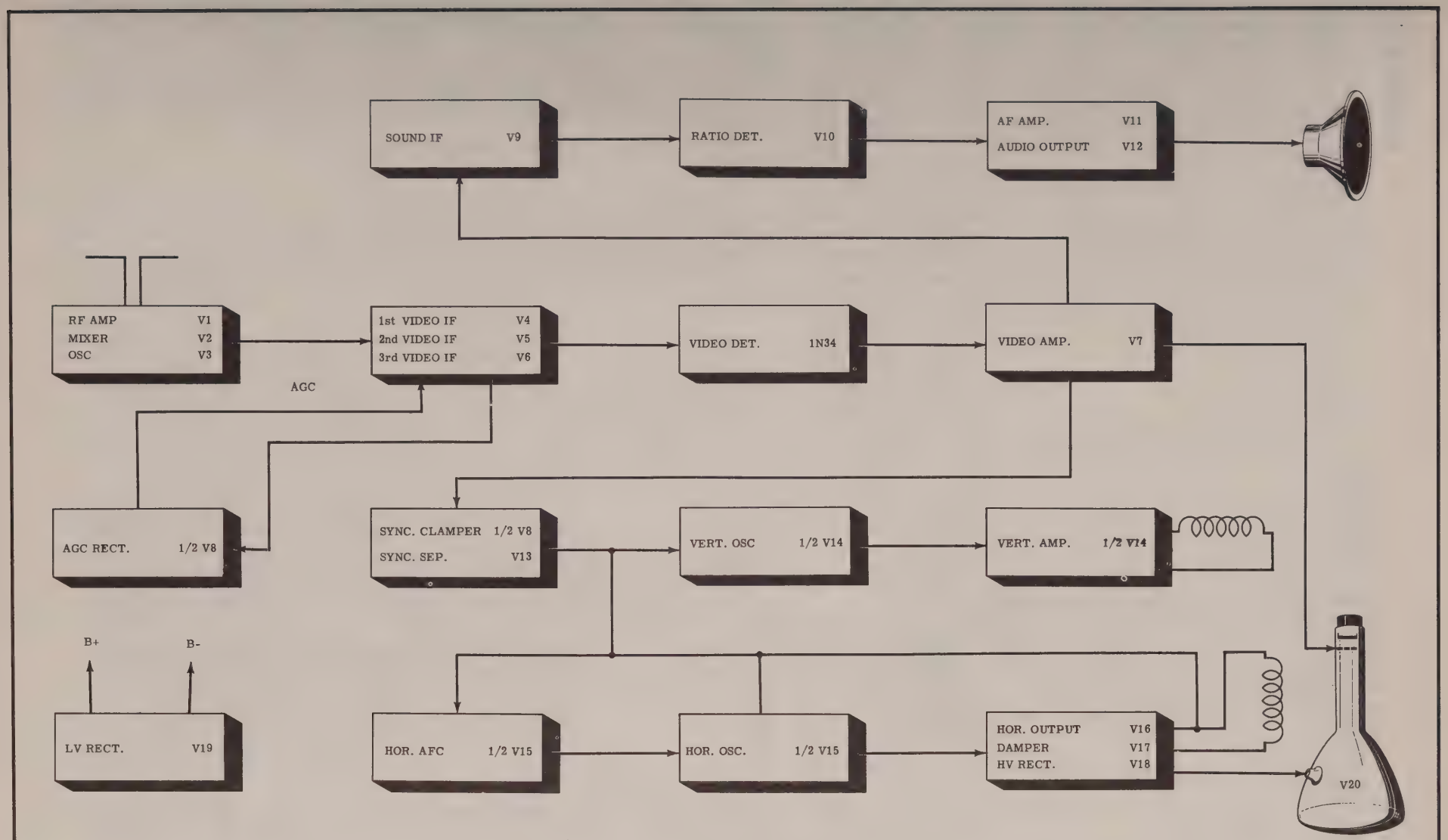
RF TUNER-RIGHT SIDE



RF TUNER-LEFT SIDE



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION



BLOCK DIAGRAM

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: FIRESTONE PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	NOTES
V1	RF Amp.	6J6	6J6	T9A	
V2	Mixer	6BE6	6BE6	T9C	
V3	Oscillator	6J6	6J6	T9A	
V4	1st Video IF Amp.	6AH6	6AH6	T8D	
V5	2nd Video IF Amp.	6AH6	6AH6	T8D	
V6	3rd Video IF Amp.	6AH6	6AH6	T8D	
V7	Video Amp.	12AU7	12AU7	S4	
V8	AGC Rect., Sync. Clipper	6AL5	6AL5	S6T	
V9	Sound IF Amp.	6AU6	6AU6	T9A	
V10	Ratio Det.	6AL5	6AL5	S6T	
V11	AF Amp.	6AT6	6AT6	T9T	
V12	Audio Output	6BW6	6BW6	S8D	
V13	Sync. Sep.	6SN7GT	6SN7GT	S8D	
V14	Vert. Osc.	6SN7GT	6SN7GT	S8D	
V15	H.V. AFC-Hor. Osc.	6SN7GT	6SN7GT	S8D	
V16	Hor. Output	6BW6	6BW6	S8T	
V17	Damper	5V4G	5V4G	S4L	
V18	H.V. Rectifier	1B3GT	1B3GT	S3C	
V19	L.V. Rectifier	5Y3G	5Y3G	S4	
V20	Picture Tube	12DP4	12DP4	T12D	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: FIRESTONE PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	40	450	TCE126-2	AF3H40-R	UF3H40-R		TVL-69	▲ Filter
B	10	350						▲ Vert. Output Plate Dec.
C2A	40	450	TCE117-D	AF8J8D26B	UP9GJ887		TVL-57	▲ Filter
B	20	150						■ Filter
C	30	50						▲ Vert. Output Cath. Byp.
C3A	80	450	TCE113-D	AF164J	UP9BJ857		TVL-47	▲ Filter
B	10	450						▲ Vert. Osc. Plate Dec.
C4A	250	15	TCE114-D	PR5J250	UP7BJ-00		TVL-66	▲ Hor. Cent. Cont. Byp. *
B	1000	6		PR6J/1000				▲ Vert. Cent. Cont. Byp.
C5A	80	450	TCE115-D	AF86Z24A§	UP8GJ886		TVL-56	■ Filter
B	30	300						▲ Filter
C	30	450						▲ Decoupling
D	30	300	TCE112-2	PRS3G0/24	BR2038-F		UT-21	Output Decoupling
E	4	25	TCE114-2	PRS1G0/4	BR550		TVA-13	Stabilizing Cap.
C8	360		TCC361-10			GP2K-390		Ant. Coupling
C9	360		TCC361-10			GP2K-390		RF Cath. Bypass
C10	360		TCC361-10			GP2K-390		RF Fil. Bypass
C11	360		TCC361-10			GP2K-390		RF Plate Dec.
C12	1		TCC010-11					RF Coupling
C13	22		TCC22-12			GP1K-22		" "
C14	5000		TCC502-SP			811-005		Mixer Screen Bypass
C15	360		TCC361-10			GP2K-390		Mixer Fil. Bypass
C16	360		TCC361-10			GP2K-390		RF Bypass
C17	1		TCC010-11					Osc. Coupling
C18	4.7		TCC4.7-11			NPOK-4.7		Osc. Feedback
C19	4.7		TCC4.7-11			NPOK-4.7		" "
C20	360		TCC361-10			GP2K-390		Osc. Fil. Bypass
C21	360		TCC361-10			GP2K-390		Switch Bypass
C22	360		TCC361-10			GP2K-390		"
C23	270	1000	TCM271-13	1468-00035	SM5T25	GP2K-270	1FM-325	IF Coupling
C24	1500		TCC152-10	1467-0015	1M5D15	GP2L-0015	1FM-215	AGC Filter
C25	5000		TCC502-SP	1467-005	1D5D5	811-005	29C1	1st V. IF Fil. Bypass
C26	1500		TCC152-10	1467-0015	1M5D15	GP2L-0015	1FM-215	1st V. IF Dec.
C27	270	1000	TCM271-13	1468-00025	SM5T25	GP2K-270	1FM-325	IF Coupling
C28	1500		TCC152-10	1467-0015	1M5D15	GP2L-0015	1FM-215	AGC Filter
C29	5000		TCC502-SP	1467-005	1D5D5	811-005	29C1	2nd V. IF Fil. Bypass
C30	1500		TCC152-10	1467-0015	1M5D15	GP2L-0015	1FM-215	2nd V. IF Dec.
C31	270	1000	TCM271-13	1467-00025	SM5T25	GP2K-270	1FM-325	IF Coupling
C32	1.5		TCC010-11			NPOK-1.5		" "
C33	30		TCC030-11				MS-43	Fixed Trimmer
C34	.25	400	TCP254-4	P488-25		GT4P25	TC-2	AGC Filter
C35	5000		TCC502-SP	1467-005	1D5D5	811-005	29C1	3rd V. IF Cath. Byp.
C36	5000		TCC502-SP	1467-005	1D5D5	811-005	29C1	3rd V. IF Fil. Byp.
C37	1500		TCC152-10	1467-0015	1M5D15	GP2L-0015	1FM-215	3rd V. IF Dec.
C38	5000		TCC502-SP	1467-005	1D5D5	811-005	29C1	RF Bypass
C39	270	1000	TCM271-13	1468-00035	SM5T25	GP2K-270	1FM-325	IF Coupling
C40	470		TCC471-10	1468-0005	5M5T5	GP2K-470	1FM-35	" "
C41	5		TCC050-11	1468-000005	5M5T5	NPOK-5	MS-55	V. Diode Filter
C42	.05	600	TCP503-10	P688-05	GT6S5		TM-15	Video Coupling
C43	5000		TCC502-SP	1467-005	1D5D5	811-005	29C1	AGC Diode Filter
C44	.05	600	TCP503-10	P488-05	GT6S5		TM-15	Video Coupling
C45	4700	500	TCM472-10	1467-005	1D5D5	GP2M-0047	1FM-25	2nd V. Amp. Cath. Byp.
C46	.25	400	TCP254-4	P488-25		GT4P25	TC-2	Pic. Tube Cath. Dec.
C47	2.2		TCC2.2-11					S. IF Coupling
C48	.02	400	TCP203-4	P488-02		GT4S2	TM-12	S. IF Cath. Bypass
C49	.1	400	TCP103-4	P488-01		G7481	GP2-335-01	TM-11 S. IF Decoupling
C50	.02		TCC2-1	1467-002	1M5D2	GP2M-002	29C5	Diode Load Cap †
				1467-002	1M5D2	GP2M-002	29C5	" " " †
C51	1500		TCC152-10	1467-0015	1M5D15	GP2L-0015	1FM-215	De-emphasis
C52	.002	600	TCP202-10	P688-002	GT6D2	GP2M-002	TM-22	Audio Coupling
C53	.39	400	TCP139-4	P488-01		G7481	GP2-335-01	TM-11 " "
C54	.002	600	TCP202-10	P688-002	GT6D2	GP2M-002	TM-22	AF Plate Bypass
C55	.01	400	TCP103-4	P488-01		G7481	GP2-335-01	TM-11 Audio Coupling
C56	.005	600	TCP502-10	P688-005	GT6D5	GP2M-005	TM-25	Output Plate Bypass
C57	.05	400	TCP503-4	P488-05	GT4S5		TM-15	Video Coupling
C58	100	500	TCM101-7	1468-0001	5M5T1	GP1K-100	1FM-31	Sync. Coupling
C59	390	1000	TCM391-14	1468-0004	5M5T4	GP2K-390	1FM-34	Sync. Amp. Cath. Bypass
C60	.002	600	TCP202-10	P688-002	GT6D2	GP2M-002	TM-22	Integrator Net.
C61	.005	600	TCP502-4	P688-005	GT6D5	GP2M-005	TM-25	" "
C62	.005	600	TCP502-4	P688-005	GT6D5	GP2M-005	TM-25	" "
C63	4700	500	TCM472-9	1467-005	1D5D5	GP2M-0047	1FM-25	Vert. Osc. Grid Cap.

CAPACITORS (CONT.)

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: FIRESTONE PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C64	.1	1000	TCP104-13	1084-1	TVC10P1		PX-11	Vert. Discharge
C65	.25	400	TCP254-4	P488-25	GT4P25		TC-2	Vert. Sweep Coupling
C66	120	500	TCM121-8			GP2K-120		Hor. Sync. Coupling
C67	120	500	TCM121-8			GP2K-120		Voltage Divider
C68	.002	600	TCP202-10	P688-002	GT6D2	GP2M-002	TM-22	Sync. Coupling
C69	.25	400	TCP254-4	P488-25	GT4P25		TC-2	AFC Filter
C70	.02	400	TCP203-4	P488-02	GT4S2		TM-12	" "
C71	.05	400	TCP503-4	P488-05	GT4S5		TM-15	AFC Plate Bypass
C72	180	500	TCM181-29			GP2K-180		Hor. Osc. Grid Cap.
C73	2200	500	TCM222-15			GP2M-0022		Hor. Discharge
C74	390	1000	TCM391-14	1468-0004	SM5T4	GP2K-390	1FM-34	Hor. Sweep Coupling
C75	.25	400	TCP254-4	P488-25	GT4P25		TC-2	Hor. Output Cath. Byp.
C76	.05	600	TCP503-10	P688-05	GT6S5		TM-15	Hor. Output Screen Byp.
C77	.035	600	TCP353-10	P688-033				Damper Filter
C78	.1	1000	TCP104-13	1084-1	TVC10P1		PX-11	" "
C79	5	1500	TCM050-20					AFC Feedback
C80	500	15000	TCM501-SP			410-500		HV Filter
C81	.01	400	TCPM103-4	P488-01	GT4S1		TM-11	Line Filter
C82	.01	400	TCPM103-4	P488-01	GT4S1		TM-11	Line Filter
C83	.25	600	TCP254-10	P688-25	GT6P25		TC-2	Hor. Sweep Coupling *

* Not used on all models.
† When either item C50A and C50B are replaced, replace both with capacitors of equal values.
‡ Omit one 10MFD section.
§ Omit bypass section.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: FIRESTONE PART No.	REPLACEMENT DATA: IRC PART No.	REPLACEMENT DATA: CLAROSTAT PART No.	INSTALLATION NOTES
R1A	11.5KΩ	½	TVC500-D		970111-24	Contrast Control (Dual Concentric)
B	500KΩ	½				Brightness Control
R2A	1 Meg.	½	TVC501-D			Vert. Hold Control (Dual Concentric)
B	50KΩ	½				Horiz. Hold Control
R3A	1 Meg.	½	TW-502-D	Q13-137	M-63-Z	Volume Control
B	Switch		Not Req.	76-1	SW-A	Attach to R3A Per Instructions
R4	5000Ω	½	TVC503-D	Q11-114	M-19-8	Vert. Linearity Control
R5	2.5 Meg	½	TVC504-D	Q11-234		Height Control
R6	20Ω	2	TVC505-D	W-20 x 10	58-20CT	Vert. Centering Control, tapped @ 10Ω (Wire Wound)*
R7	20Ω	2	TVC507-D	W-20	58-20	Horiz. Centering Control (Wire Wound) *
R8	22500Ω	4	TVC506-D		970111-25	Focus Control, (Wire Wound)

*Not used in all models.

RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: FIRESTONE PART No.	REPLACEMENT DATA: IRC PART No.	IDENTIFICATION CODES: ALL RESISTORS ARE ± 10% UNLESS OTHERWISE STATED.
R9	56Ω	½	TRC560-2		RF Cathode
R10	33Ω	½	TRC331-2		" "
R11	1000Ω	½	TRC102-1	BTS-1000	RF Plate Decoupling 20%
R12	1 Meg.	½	TRC106-1		Mixer Grid *
R13	4700Ω	½	TRC472-3		Mixer Grid Coil Shunt
R14	1000Ω	½	TRC102-1	BTS-1000	Mixer Decoupling
R15	27KΩ	½	TRC273-1		Osc. Grid 20%
R16	27KΩ	½	TRC273-1		" " 20%
R17	47Ω	½	TRC470-1		Osc. Cathode
R18	5600Ω	½	TRC562-3	BTS-5600-5%	1st Video IF Grid 5%
R19	39Ω	½	TRC390-2		1st Video IF Cathode
R20	1000Ω	½	TRC102-1		1st Video IF Decoupling 20%
R21	330Ω	½	TRC331-2		AGC Network
R22	15KΩ	½	TRC153-3		2nd Video IF Grid 5%
R23	39Ω	½	TRC390-2		2nd Video IF Cathode
R24	1000Ω	½	TRC102-1		2nd Video IF Decoupling 20%
R25	330Ω	½	TRC331-2		AGC Network
R26	10KΩ	½	TRC103-3		3rd Video IF Grid Coil Shunt 5%
R27	100Ω	½	TRC101-2		3rd Video IF Cathode
R28	1000Ω	½	TRC102-1		3rd Video IF Decoupling 20%
R29	560KΩ	½	TRC564-2	BTS-560K	AGC Network
R30	120KΩ	½	TRC124-2	BTS-120K	AGC Diode Load
R31	1500Ω	1	TRC152-1	BTS-1500	Voltage Divider 20%
R32	120KΩ	1	TRC124-5	BTA-120K	" "
R33	5600Ω	½	TRC562-3	BTS-5600-5%	Video Det. Load 5%
R34	1 Meg.	½	TRC106-1	BTS-1 Meg.	1st Video Amp. Grid 20%
R35	3300Ω	1	TRC332-5	BTA-3300	1st Video Amp. Plate
R36	47Ω	½	TRC470-1		2nd Video Amp. Cathode
R37	1 Meg.	½	TRC105-1	BTS-1 Meg-5%	2nd Video Amp. Grid 5%
R38	3300Ω	1	TRC332-5	BTA-3300	2nd Video Amp. Plate
R39	1000Ω	½	TRC102-2	BTS-1000-5%	" " " 5%
R40	100KΩ	½	TRC104-2	BTS-100K	Voltage Divider
R41	82Ω	½	TRC820-2		1st Sound IF Cathode
R42	1200Ω	½	TRC122-1		1st Sound IF Decoupling 20%
R43	220Ω	½	TRC221-1		Balancing 20%
R44	2200	½	TRC221-1		" 20%
R45	47KΩ	½	TRC473-1	BTS-47K	De-emphasis 20%
R46	15KΩ	½	TRC153-3	BTS-15K-5%	Ratio Det. Diode Load 5%
R47	15KΩ	½	TRC153-3	BTS-15K-5%	" " 5%
R48	5.1Ω	½	TRC51A-4	BW-½-4.7	Ratio Det. Filament (Wire Wound)
R49	10 Meg.	½	TRC106-1	BTS-10 Meg.	AF Grid 20%
R50	330KΩ	½	TRC334-1	BTS-330K	AF Plate 20%
R51	470KΩ	½	TRC474-1	BTS-470K	Output Grid 20%
R52	1000Ω	1	TRC102-4	BW-1-1000	Filter
R53	1 Meg.	½	TRC105-1	BTS-1 Meg.	Sync. Sep. Grid
R54	15KΩ	1	TRC153-4	BTA-15K	Sync. Sep. Plate
R55	3.9 Meg.	½	TRC395-2	BTS-3.9 Meg.	Sync. Sep. Grid
R56	680Ω	½	TRC682-1	BTS-680Ω	Sync. Sep. Cathode 20%
R57	22KΩ	½	TRC223-1	BTS-22K	Integrator 20%
R58	8200Ω	½	TRC822-2	BTS-8200	"
R59	8200Ω	½	TRC822-2	BTS-8200	"
R60	1 Meg.	½	TRC105-3	BTS-1 Meg-5%	Vert. Osc. Grid 5%
R61	1.5 Meg.	½	TRC155-2	BTS-1.5 Meg.	Vert. Osc. Plate
R62	6.8 Meg.	½	TRC685-2	BTS-6.8 Meg.	Voltage Divider
R63	100KΩ	½	TRC104-2	BTS-100K	"
R64	560Ω	½	TRC561-2	BTS-560K	Vert. Amp. Cathode
R65	2.2 Meg.	½	TRC225-1	BTS-2.2 Meg.	Vert. Amp. Grid 20%

RESISTORS (CONT.)

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: FIRESTONE PART No.	REPLACEMENT DATA: IRC PART No.	IDENTIFICATION CODES
R66	3300Ω	½	TRC332-1	BTS-3300	Vert. Peaking 20%
R67	1000Ω	½	TRC102-1	BTS-1000	Filter 20%
R68	560KΩ	½	TRC564-3	BTS-560K-5%	Horiz. AFC Grid 5%
R69	180KΩ	½	TRC184-2	BTS-180K	Horiz. AFC Cathode
R70	100KΩ	1	TRC104-5	BTA-100K	Horiz. AFC Cathode
R71	82000Ω	½	TRC822-2	BTS-8200	Horiz. AFC Filter Network
R72	150KΩ	½	TRC154-2	BTS-150K	" " "
R73	3.3 Meg.	1	TRC335-6	BTA-3.3Meg-5%	Voltage Divider 5%
R74	30KΩ	½	TRC303-12		Voltage Divider Temp. Comp.
R75	120KΩ	½	TRC124-2	BTS-120K	" "
R76	270KΩ	1	TRC274-5	BTA-270K	" "
R77	100KΩ	½	TRC104-SP		Horiz. Osc. Grid Special 1%
R78	10KΩ	½	TRC103-2	BTS-10K	Horiz. Osc. Transformer Shunt
R79	120KΩ	1	TRC124-5	BTA-120K	Horiz. Osc. Plate
R80	47Ω	½	TRC470-1		Parasitic Supp. 20%
R81	1 Meg.	½	TRC105-3	BTS-1 Meg-5%	Horiz. Output Grid 5%
R82	68Ω	1	TRC680-5	BW-1-68	Horiz. Output Cathode
R83	4700Ω	1	TRC472-5	BTA-4700	Horiz. Output Screen
R84	56KΩ	½	TRC563-2	BTS-56K	Feedback
R85	10KΩ	½	TRC103-2	BTS-10K	Filter
R86	560KΩ	½	TRC564-2	BTS-560K	Feedback
R87	3.3Ω	½	TRC33A-2		HV Filament
R88	1 Meg.	½	TRC-105-8		HV Filter
R89	680Ω	1	TRC681-4	BTA-680	Focus Coil Shunt
R90	680Ω	1	TRC681-4	BTA-680	" " "
R91A	1125Ω	20	TRP-1		Filter (Wire Wound)
B	610Ω	20			Bias Network (Wire Wound)
R92A	8200Ω	5	TRP-2	AB-8000	Bleeder (Wire Wound)
B	35Ω	8		BW-1-35	Voltage Divider (Wire Wound)
C	100Ω	2		BW-2-100	Bias Network (Wire Wound)
R93	39Ω	1	TRC390-5	BW-1-39	" "

TRANSFORMER (POWER)

ITEM No.	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: FIRESTONE PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: CHICAGO PART No.	REPLACEMENT DATA: MERIT PART No.
T1	117VAC @ 1.84A	740VCT @ 230ADC SEC. 4 6.3VC @ 6.7A	5VAC @ 3A SEC. 5 6.3VC @ .9A	5VAC @ 2A	TTR105	P-8153 ‡	TP-450	P-3059

‡ Drill new mounting holes.

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING: DC RESISTANCE PRI.	RATING: DC RESISTANCE SEC.	REPLACEMENT DATA: FIRESTONE PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: CHICAGO PART No.	REPLACEMENT DATA: MERIT PART No.	NOTES
T2	150Ω Tap @ 41Ω		TTR157				Hor.Osc. Transformer
T3	165Ω	12.1Ω	TTR152	A-8121	TB0-1	A-4000	Vert.Osc. Trans.
T4	420Ω Tap @ 180Ω	SEC. 1 .5Ω 10.6Ω Tap @ .5Ω SEC. 2 .9Ω	TTR154	A-8117	TFB-2		Hor. Output Trans.
T5	590Ω	7Ω	TTR153	A-8115	TS0-1	A-3035	Vert.Output Trans.
T6A	14Ω		TTR159-D	DY-1			Hor. Deflection Coil
B	63Ω						Vert. Deflection Coil
T7	240Ω		TLF521-D				Focus Coil

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	RATING: IMPEDANCE SEC.	RATING: DC RES. PRI.	RATING: DC RES. SEC.	REPLACEMENT DATA: FIRESTONE PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: CHICAGO PART No.	REPLACEMENT DATA: MERIT PART No.	INSTALLATION NOTES
T8	6600Ω	3.4Ω	460Ω	.25Ω	TTR156	A-3878	RO-13	A-2931	

SPEAKER

ITEM No.	RATING		REPLACEMENT DATA: FIRESTONE PART No.	REPLACEMENT DATA: JENSEN PART No.	REPLACEMENT DATA: QUAM PART No.	NOTES
	FIELD RES.	V. C. IMP.				
SP1	PM	3.5Ω	TSP462		46A15	
	CONE DIA.	V. C. DIA.				
SP2	3 7/8"x 5 7/8"	9/16"				

FILTER CHOKE

ITEM No.	RATINGS: TOTAL DIRECT CURRENT	RATINGS: D. C. RESISTANCE	RATINGS: INDUCTANCE (@ CURRENT 1000 ma)	REPLACEMENT DATA: FIRESTONE PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: CHICAGO PART No.	REPLACEMENT DATA: MERIT PART No.	INSTALLATION NOTES
L1	.230A	38Ω	1 Henry	TTR106-D	C-2325 ‡	TR-4200 ‡	C-2951 ‡	‡ Drill one new mounting hole.

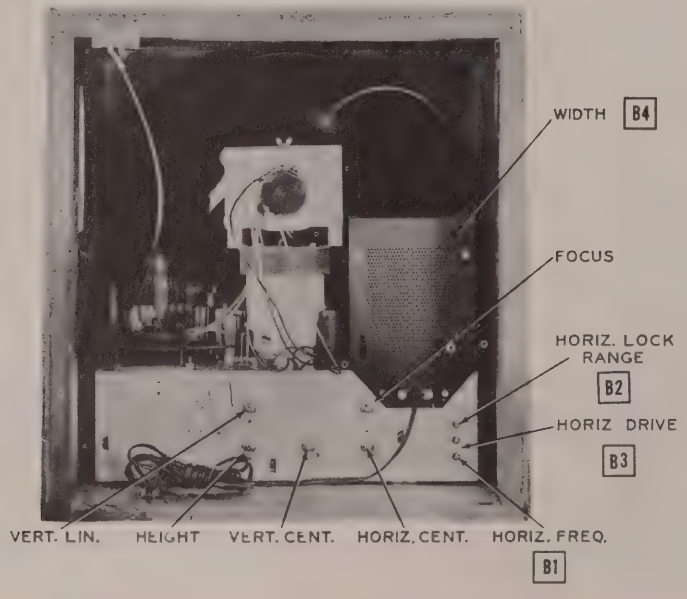
PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

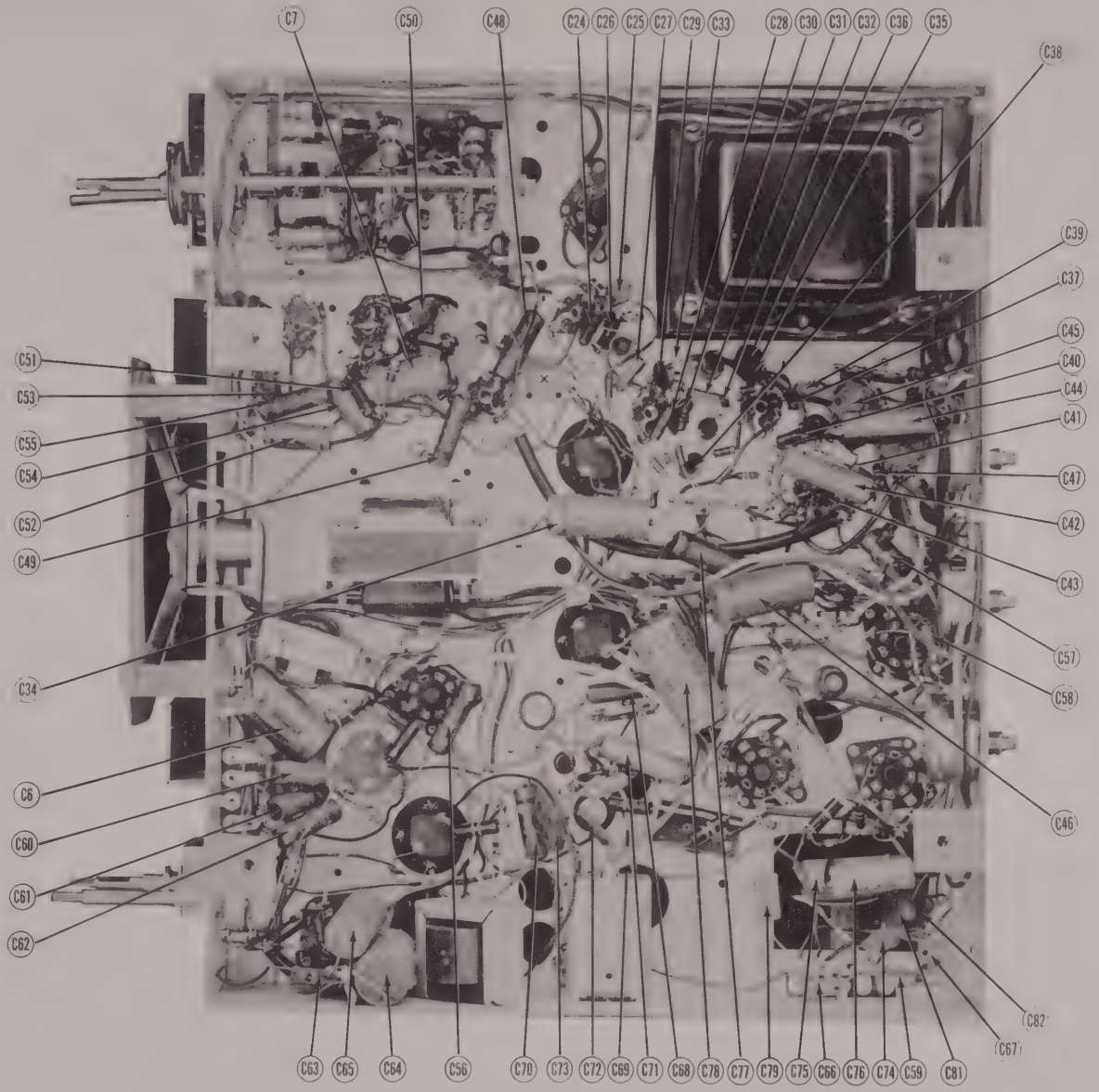
ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA FIRESTONE PART No.	REPLACEMENT DATA MEISSNER PART No.	NOTES
L2	RF Choke	.1Ω		TLF140-D		
L3	RF End Inductance	0Ω		TLF143-D		
L4	RF End Inductance	0Ω		TLF143-D		
L5	RF Choke	.1Ω		TLF140-D		
L6A	Osc. Coil	0Ω		TLF120-1D		Channel 2
B	Osc. Coil	0Ω		TLF120-2D		Channel 3
C	Osc. Coil	0Ω		TLF120-3D		Channel 4
D	Osc. Coil	0Ω		TLF120-4D		Channel 5
E	Osc. Coil	0Ω		TLF120-5D		Channel 6
F	Osc. Coil	0Ω		TLF120-6D		Channel 7
G	Osc. Coil	0Ω		TLF120-7D		Channel 8
H	Osc. Coil	0Ω		TLF120-8D		Channel 9
I	Osc. Coil	0Ω		TLF120-9D		Channel 10
J	Osc. Coil	0Ω		TLF120-10D		Channel 11
K	Osc. Coil	0Ω		TLF120-10D		Channel 12
L	Osc. Coil	0Ω		TLF120-10D		Channel 13
L7	1st Video IF	.1Ω		TLF147-D		
L8	2nd Video IF	.1Ω		TLF517-D		
L9	IF Plate Choke	2Ω		TLF146-D		
L10	3rd Video IF	.1Ω		TLF148-D		
L11	Sound Trap	0Ω		TTR158		
L12	IF Plate Choke	2Ω		TLF146-D		
L13	4th Video IF	.1Ω		TLF149D		
L14	Peaking	3Ω				36 Microhenries
L15	Peaking	5Ω		TLF502		120 Microhenries. Wound on 22KΩ resistor.
L16	Peaking	5Ω		TLF503		100 Microhenries.
L17	Peaking	4.5Ω				36 Microhenries.
L18	Peaking	5Ω		TLF502		120 Microhenries. Wound on 22KΩ resistor.
L19	Sound IF	1Ω		TLF114-D		
L20	Ratio Det. Trans.	4Ω	.3Ω	TLF115-D		
L21	Width Cont.	.2Ω		TLF505		
L22	Hor. Linearity	32Ω		TLF506		

MISCELLANEOUS

ITEM No.	PART NAME	FIRESTONE PART No.	NOTES
M1	Channel Switch	TWS102-D	
M2	Ion Trap	TLF500	
M4	Video Detector		Sylvania 1N34
M5	Fuse		.25A
	Cabinet	TCB258-D	
	Safety Glass	TGL106-D	
	Back	TBK158-D	
	Knob	TKN100	Outside Knob
	Knob	TKN101	Inside Knob (Small Shaft)
	Knob	TKN103	Inside Knob (Large Shaft)
	Knob	TKN108	Inside Knob (Small Shaft Engraved Dot.)
	Trimmer Strip Ass'y.	TAS501-D	Hor. Locking, Hor. Drive, and Hor. Freq.



CABINET-REAR VIEW



CHASSIS BOTTOM VIEW–CAPACITOR IDENTIFICATION

HORIZONTAL OSCILLATOR ADJUSTMENT

(A). Connect antenna to receiver and properly tune in a picture, (preferably a test pattern).

(B). Turn B1 and B2 fully clockwise and then back both off one turn.

(C). Turn the horizontal hold control fully clockwise.

(D). Adjust B3 until picture shows from 3 1/2 to 4 1/2 bars sloping downward to the right.

(E). Turn the horizontal hold control maximum counter-clockwise. Momentarily interrupt the signal by switching to another channel and back again.

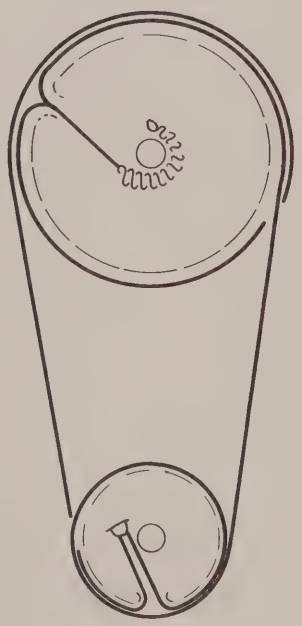
(F). Rotate the horizontal hold control slowly clockwise. The number of sloping bars should decrease, at approximately 90 degrees of rotation there should remain 3 1/2 to 4 1/2 bars, just before the picture falls into sync. The picture should remain in sync for approximately 90 degrees more rotation. If there is more than 4 1/2 or less than 3 1/2 bars just before picture falls into sync slightly retouch B2.

(A). Adjust B4 until picture fills the mask horizontally.

(B). Adjust B5 clockwise as far as possible without crowding the left side of the test pattern.

(C). Adjust B6 for best linearity of pattern on screen.

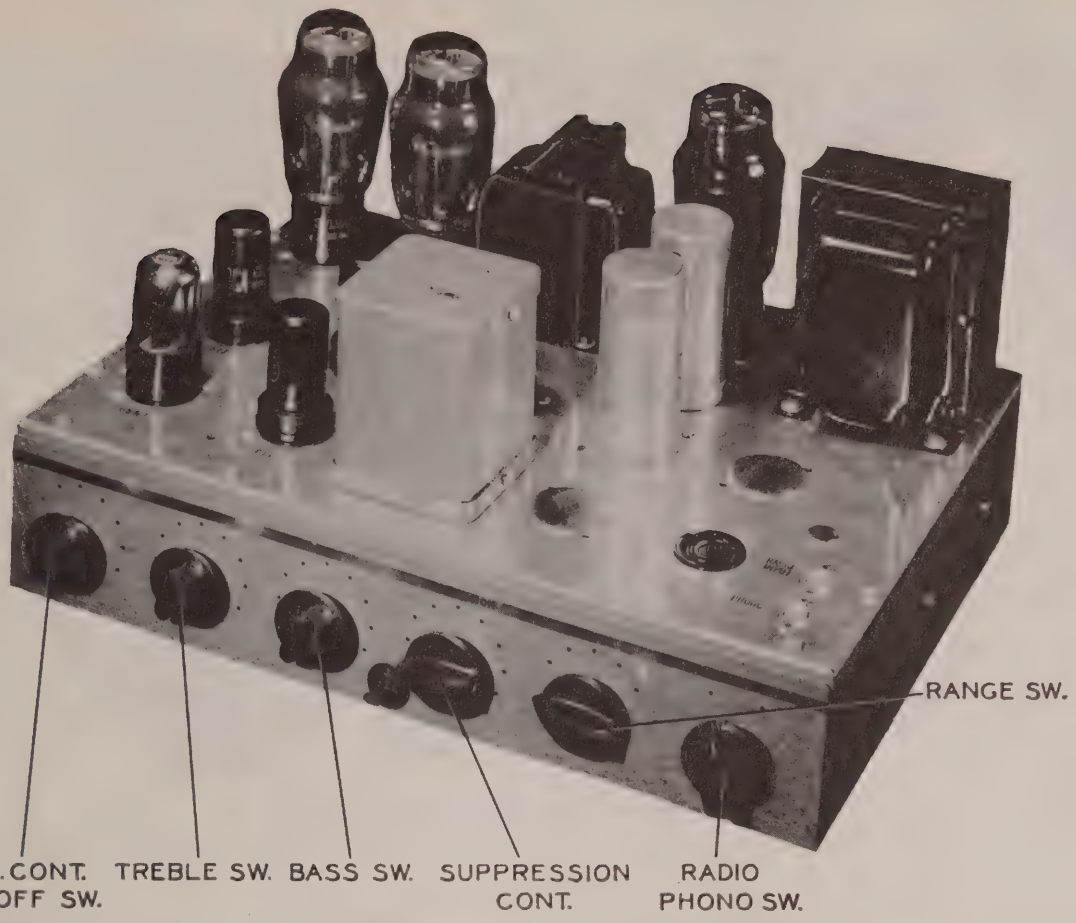
DIAL CORD STRINGING



FINE TUNING CONTROL

FIRESTONE
MODEL 13-G-4

GOODELL
MODEL NSA-20



GOODELL
MODEL NSA-20

GOODELL MODEL NSA-20

TRADE NAME	Goodell, Model NSA-20
MANUFACTURER	The Minnesota Electronics Corp., 97 East 5th St., St. Paul, Minnesota
TYPE SET	AC Operated 2 Channel Audio Amplifier
TUBES(EIGHT)	Types 6SJ7 1st AF Amp., 6J5 Tone Amp., 6SN7GT 2nd AF-Phase Inverter, (2) 6SJ7 Driver, (2) 6L6G Power Output, 5U4G Rectifier
POWER SUPPLY	110-120 Volts AC RATING: .78 Amp. @ 117 Volts AC

HOWARD W. SAMS & CO., INC. • Indianapolis Indiana

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DATE 10/49 SET #73 FOLDER #6

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA		RMA BASE TYPE	INSTALLATION NOTES
		GOODELL PART No.	STANDARD REPLACEMENT		
V1	1st AF Amp.	6SJ7	6SJ7	8N	
V2	Tone Amp.	6J5	6J5	6Q	
V3	2nd AF Amp.-Phase Inverter	6SN7GT	6SN7GT	8BD	
V4	Driver	6SJ7	6SJ7	8N	
V5	Driver	6SJ7	6SJ7	8N	
V6	Power Output	6L6G	6L6G	7AC	
V7	Power Output	6L6G	6L6G	7AC	
V8	Rectifier	5U4G	5U4G	5T	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

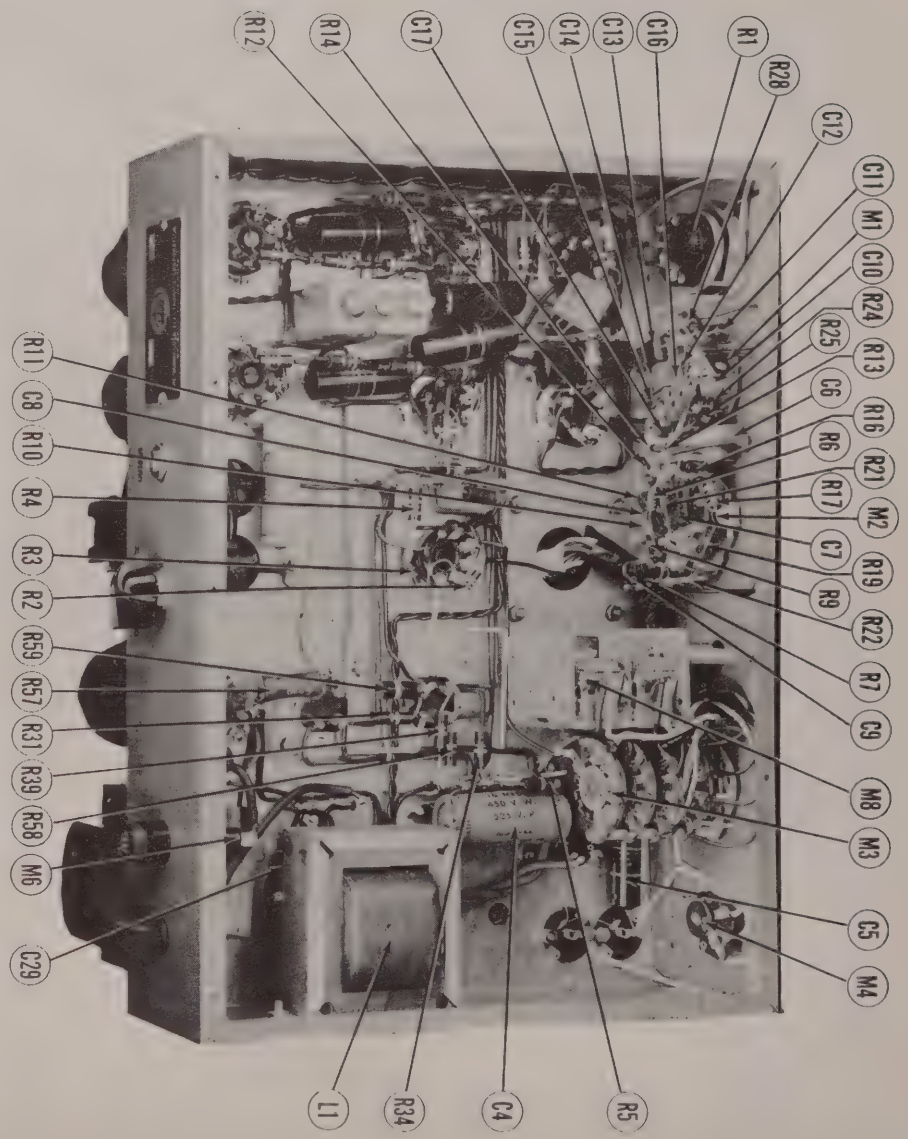
ITEM No.	RATING		REPLACEMENT DATA					IDENTIFICATION CODES AND INSTALLATION NOTES
	CAP.	VOLT	GOODELL PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	
C1	16	450		PRS450/16	BR1645		UT-16	Filter
C2A	40	450		AF862J4A	UP		EL-424	▬ Filter
B	30	450			43145C			■ Decoupling
C	10	450						▲ Decoupling
D	20	25						Output Cath. Bypass
C3A	40	450		AF862J4A	UP		EL-424	▬ Output Screen Bypass
B	30	450			43145C			■ Decoupling
C	10	450						▲ 2nd AF Amp. Dec.
D	20	25						Output Cath. Bypass
C4	16	450		PRS450/16	BR1645		UT-16	Decoupling
C5	.047	600		P688-047	GT6S5		TM-15	Audio Coupling Note 1
C6	.1	600		P688-1	GT6P1		TM-1	Audio Coupling
C7	1000	500		1468-001	1W5D1	GP2L-001	1FM-21	Tone Compensation
C8	1000	500		1468-001	1W5D1	GP2L-001	1FM-21	Tone Compensation
C9	.01	400		P488-01	GT4S1	GP2-335-01	TM-11	Tone Compensation
C10	100	500		1468-0001	5W5T1	GP1K-100	1FM-31	Tone Compensation
C11	.01	400		P488-01	GT4S1	GP2-335-01	TM-11	Tone Compensation
C12	3000	500		1467-003	1W5D3	GP2M-003	1FM-23	Tone Compensation
C13	1000	500		1468-001	1W5D1	GP2L-001	1FM-21	Tone Compensation
C14	500	500		1468-0005	5W5T5	GP2K-500	1FM-35	Tone Compensation
C15	250	500		1468-00025	5W5T25	GP2K-250	1FM-325	Tone Compensation
C16	24	500		1468-000025	5W5Q25	GP1K-25	MS-425	Tone Compensation Note 2
C17	24	500		1468-000025	5W5Q25	GP1K-25	MS-425	Tone Compensation Note 2
C18	.1	600		P688-1	GT6P1		TM-1	Audio Coupling
C19	.0022	600		P688-0022	GT6D2	GP2M-0025	TM-22	2nd AF Amp. Cath. Byp.
C20	.01	600		P688-01	GT6S1	GP2-335-01	TM-11	Audio Coupling
C21	1000	500		1468-001	1W5D1	GP2L-001	1FM-21	2nd AF Plate Bypass Note 2
C22	.1	600		P688-1	GT6P1		TM-1	Audio Coupling
C23	.1	600		P688-1	GT6P1		TM-1	Audio Coupling
C24	.1	600		P688-1	GT6P1		TM-1	Audio Coupling
C25	.1	600		P688-1	GT6P1		TM-1	Audio Coupling
C26A	.5	600		630T-2x.5	DYRT		BP2506	Driver Screen Bypass
B	.5	600			-6055			Driver Screen Bypass
C27	.1	600		P688-1	GT6P1		TM-1	Filament Bypass
C28	.1	600		P688-1	GT6P1		TM-1	Filament Bypass
C29	.01	600		P688-01	GT6S1		TM-11	Line Filter

Note 1. Some Models Use .1MFD In This Application.
Note 2. Not Used In All Models.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA			INSTALLATION NOTES
	RESISTANCE	WATTS	GOODELL PART No.	IRC PART No.	CLAROSTAT PART No.	
R1A	500KΩ	½		Q13-133	M-60-Z	Volume control
B	Switch			76-1	SW-A	Attach to R1A per instructions

CHASSIS—BOTTOM VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		IDENTIFICATION CODES
	RESISTANCE	WATTS	GOODELL PART No.	IRC PART No.	
R2	470KΩ	½		BTS-470K	1st AF Grid
R3	560Ω	1		BTS-560	1st AF Cathode
R4	27KΩ	1		BTA-27K	1st AF Plate
R5	27KΩ	1		BTA-27K	Filter
R6	470KΩ	½		BTS-470K	Tone Compensation
R7	22KΩ	½		BTS-22K	Tone Compensation
R8	100KΩ	½		BTS-100K	Tone Compensation
R9	100KΩ	½		BTS-100K	Tone Compensation
R10	100KΩ	½		BTS-100K	Tone Compensation
R11	100KΩ	½		BTS-100K	Tone Compensation
R12	47KΩ	½		BTS-47K	Tone Compensation
R13	22KΩ	½		BTS-22K	Tone Compensation
R14	470KΩ	½		BTS-470K	Tone Compensation
R15	68KΩ	1		BTA-68K	Tone Compensation
R16	100KΩ	½		BTS-100K	Tone Compensation
R17	68KΩ	1		BTA-68K	Tone Compensation
R18	47KΩ	½		BTS-47K	Tone Compensation
R19	33KΩ	½		BTS-33K	Tone Compensation
R20	470KΩ	½		BTS-470K	Tone Compensation
R21	22KΩ	½		BTS-22K	Tone Compensation
R22	47KΩ	½		BTS-47K	Tone Compensation
R23	100KΩ	½		BTS-100K	Tone Compensation
R24	100KΩ	½		BTS-100K	Tone Compensation
R25	100KΩ	½		BTS-100K	Tone Compensation
R26	220KΩ	½		BTS-220K	Tone Compensation
R27	220KΩ	½		BTS-220K	Tone Compensation
R28	100KΩ	½		BTS-100K	Tone Amp. Grid
R29	2700Ω	1		BTS-2700	Tone Amp. Cathode
R30	100KΩ	1		BTA-100K	Tone Amp. Plate
R31	20KΩ	1		BTA-22K	Filter
R32	2700Ω	1		BTS-2700	2nd AF Cathode
R33	100KΩ	1		BTA-100K	2nd AF Plate
R34	20KΩ	1		BTA-22K	Filter
R35	470KΩ	½		BTS-470K	Phase Inv. Grid
R36	2700Ω	½		BTS-2700	Phase Inv. Cathode
R37	24KΩ	1		BTA-22K	Phase Inv. Cathode
R38	24KΩ	1		BTA-22K	Phase Inv. Plate
R39	20KΩ	1		BTA-22K	Filter
R40	470KΩ	½		BTS-470K	Driver Grid
R41	560Ω	½		BTS-560	Driver Cathode
R42	6800Ω	½		BTS-6800	Driver Cathode
R43	47KΩ	½		BTS-47K	Driver Cathode
R44	100KΩ	1		BTA-100K	Driver Plate
R45	430KΩ	½		BTS-470K	Driver Screen
R46	470KΩ	½		BTS-470K	Driver Grid
R47	560Ω	½		BTS-560	Driver Cathode
R48	6800Ω	½		BTS-6800	Driver Cathode
R49	100KΩ	1		BTA-100K	Driver Plate
R50	430KΩ	½		BTS-470K	Driver Screen
R51	100KΩ	5			Feedback See Note
R52	10KΩ	½		BTS-10K	Output Grid
R53	240KΩ	½		BTS-220K	Output Grid
R54	100KΩ	5			Feedback See Note
R55	10KΩ	½		BTS-10K	Output Grid
R56	240KΩ	½		BTS-220K	Output Grid
R57	220Ω	5		AB-225	Output Cathode Wire Wound
R58	20KΩ	1		BTA-22K	Filter
R59	1000Ω	2		BW-2-1000	Filter
R60	47KΩ	½		BTS-47K	Feedback
R61	240KΩ	½		BTS-220K	Feedback
R62	330KΩ	½		BTS-330K	Feedback
R63	47KΩ	1		BTA-47K	Filter

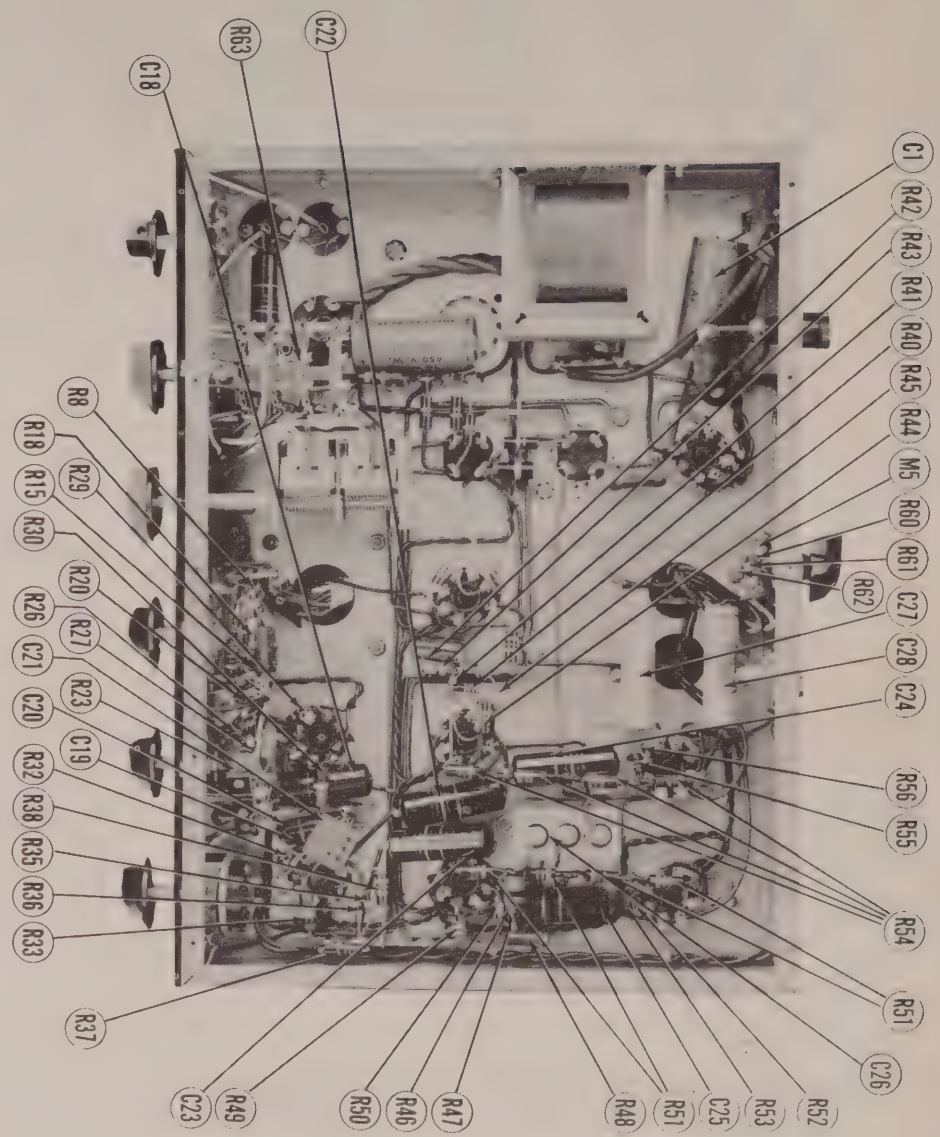
Note - Four 24KΩ, 1 Watt Resistors Used In Series To Obtain Correct Resistance And Wattage.

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA			
	PRI.	SEC. 1	SEC. 2	SEC. 3	GOODELL PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.
T1	117VAC @ .78A	600VCT .11A DC	5VAC @ 3A	6.3VAC @ 3.5A		P-4080‡	P-3153‡	PV-120

‡ Drill New Mtg. Holes And Add Series Resistor To Reduce Plate Voltage.

CHASSIS—BOTTOM VIEW



DATE 10/49 SET #73 FOLDER #6

PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA				INSTALLATION NOTES
	IMPEDANCE		DC RES.		GOODELL PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
	PRI.	SEC.	PRI.	SEC.					
T2	5KΩ CT	4Ω 8Ω 16Ω 250Ω 500Ω	285Ω CT	.6Ω .8Ω 1.1Ω 13Ω 20Ω		A-3800§	A-3131§	PCO-80§	§ Drill New Mounting Hole.

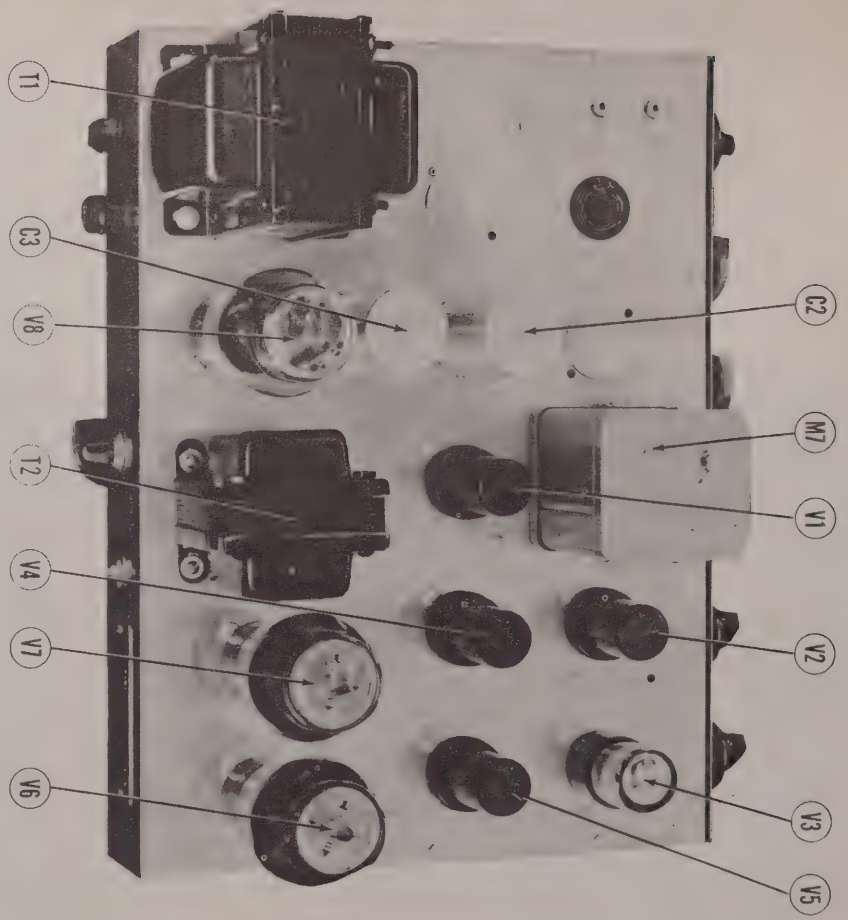
FILTER CHOKE

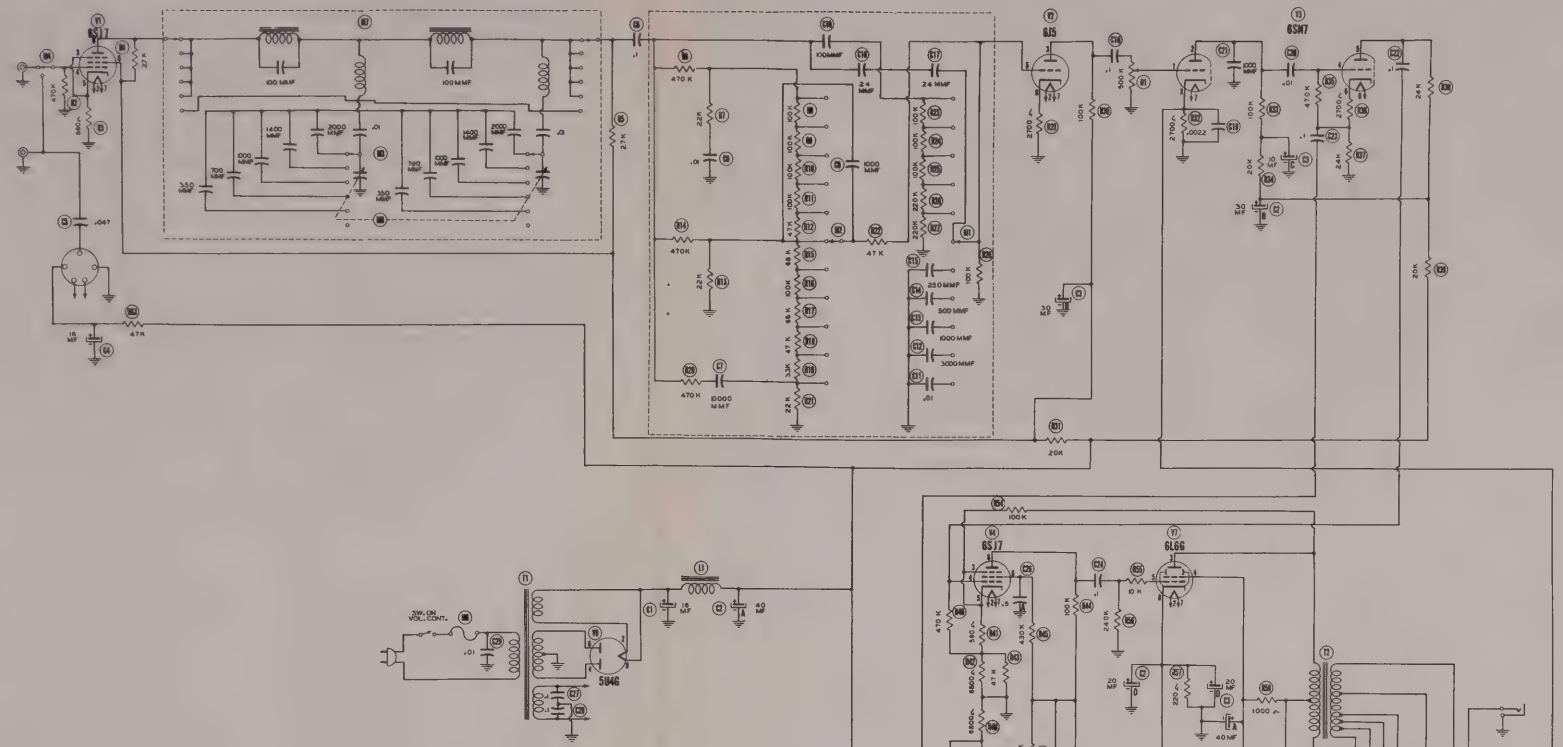
ITEM No.	RATINGS			REPLACEMENT DATA				INSTALLATION NOTES
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (0 CURRENT 1000 ∽)	GOODELL PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
L1	.110A	210Ω	8 Henries		C-1001#	C-2993#	R-8120#	# Drill One New Mounting Hole.

MISCELLANEOUS

ITEM No.	PART NAME	GOODELL PART No.	NOTES
M1	Switch		Treble
M2	Switch		Bass
M3	Switch		Range
M4	Switch		Radio-Phono
M5	Switch		Output Impedence
M6	Fuse		15 Amp.
M7	Filter		Noise Suppression
M8	2 Gang Var.Cap.		(22-472MMF) Each Section

CHASSIS—TOP VIEW





Radio-Phono Switch In Radio Position.

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	6SJ7	-3V	#3VAC	3.6VDC	0V	3.6VDC	125VDC	#3VAC	60VDC
V 2	6J5	0V	#3VAC	5.6VDC	0V	0V	80VDC	#3VAC	2VDC
V 3	6SN7GT	-1V	#3VAC	3.1VDC	25VDC	185VDC	50VDC	#3VAC	#1.8VAC
V 4	6SJ7	-1V	#3VAC	25VDC	13VDC	25VDC	70VDC	#3VAC	120VDC
V 5	6SJ7	0V	#3VAC	25VDC	20VDC	25VDC	76VDC	#3VAC	125VDC
V 6	6L6G	0V	#3VAC	275VDC	280VDC	1.2VDC	1.2VDC	#3VAC	21.5VDC
V 7	6L6G	0V	#3VAC	275VDC	280VDC	0V	0V	#3VAC	21.5VDC
V 8	5U4G	0V	310VDC	0V	290VAC	0V	290VAC	0V	310VDC

6.3VAC Measured Across Filaments.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	6SJ7	0Ω	Inf.	550Ω	470KΩ	550Ω	120KΩ	Inf.	135KΩ
V 2	6J5	0Ω	Inf.	112KΩ	Inf.	40KΩ	38KΩ	Inf.	2.7KΩ
V 3	6SN7GT	0Ω	114KΩ	2.7KΩ	500KΩ	145KΩ	26KΩ	Inf.	Inf.
V 4	6SJ7	0Ω	Inf.	6KΩ	470KΩ	6KΩ	143KΩ	Inf.	112KΩ
V 5	6SJ7	0Ω	Inf.	6.5KΩ	470KΩ	6.5KΩ	143KΩ	Inf.	112KΩ
V 6	6L6G	0Ω	Inf.	730KΩ	11.2KΩ	250KΩ	240KΩ	Inf.	220Ω
V 7	6L6G	0Ω	Inf.	734Ω	11.2KΩ	250KΩ	240KΩ	Inf.	220Ω
V 8	5U4G	Inf.	35KΩ	Inf.	100Ω	Inf.	95Ω	Inf.	35KΩ

† Measured From Pin 8 Of V8.

1 - DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1000 ohms per volt.
2 - Socket connections are shown as bottom views.
3 - Measured values are from socket pin to common negative.
4 - Line voltage maintained at 117 volts for voltage readings.
5 - Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6 - Volume control at minimum, proper output load connected.

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FIGURE 1

GENERAL INFORMATION

The Model 11600 automatic record changer is a precision-built, three-speed gearless and beltless mechanism, designed to play automatically twelve 7-inch or 10-inch records, or ten 12-inch records, not intermixed. In addition to the standard 78 R.P.M. records, it will also play microgroove 33 R.P.M. and 45 R.P.M. records. The last record will be repeated until the changer is turned off. This changer is a two-knob controlled mechanism; one provides Off, Manual, Automatic, and Reject operations, while the other controls the three speeds of the turntable. Any record may be rejected while playing by turning the control knob to Reject momentarily. Manual operation is provided for single records, home recordings, or odd-size records.

This changer is designed to operate on 117-volt, 60-cycle alternating current unless otherwise specified on motor.

Manufactured by

MILWAUKEE STAMPING COMPANY

MILWAUKEE 14, WISCONSIN

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DATE 10/49 SET #73 FOLDER 7

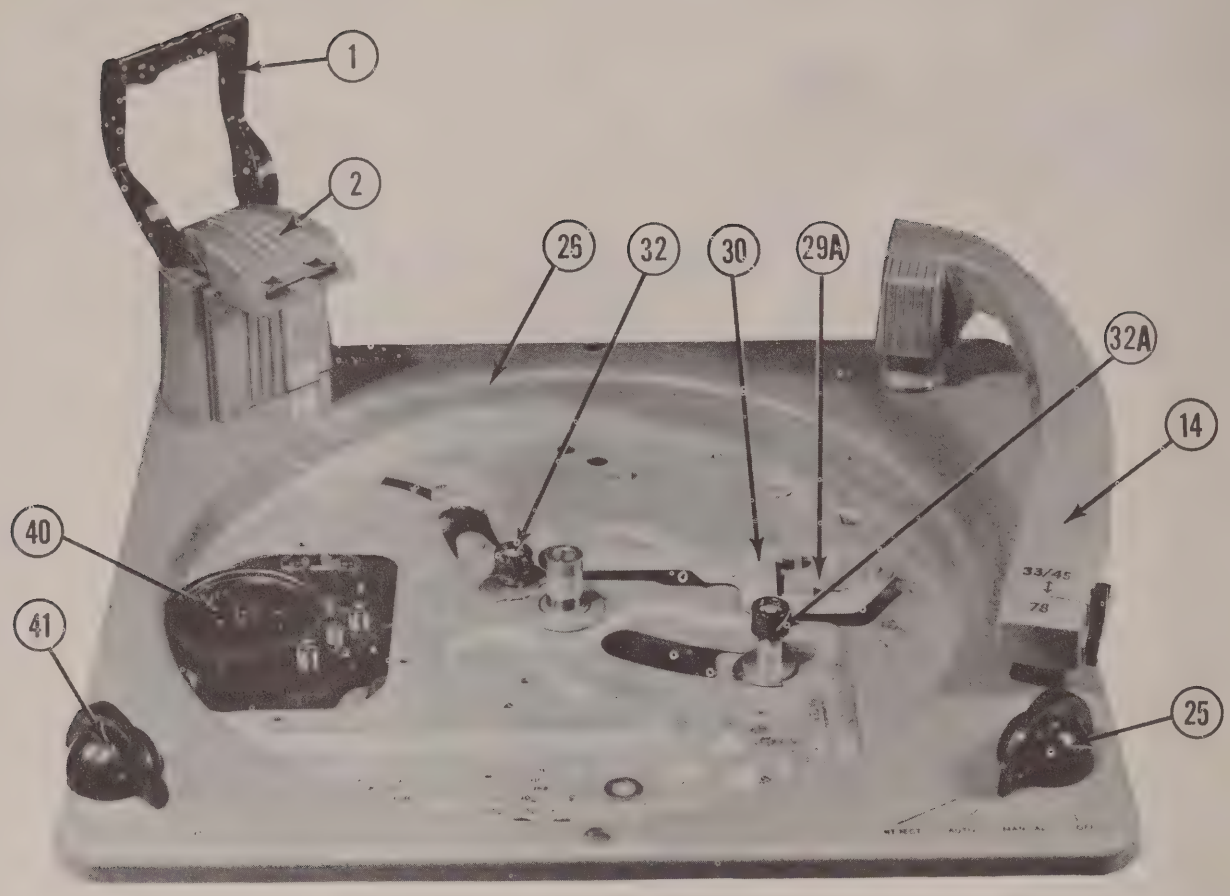


FIGURE 2

AUTOMATIC OPERATION

1. Be sure the pickup arm (14) is on the pickup arm rest (24).

2. Tilt cartridge so that arrow points to speed at which records are to be played (either 78 or 33/45).

3. Raise the balance arm (1) to a vertical position.

4. Place proper center post in place; (12) for 10″ or 12″ records, (11) for 7″ records with standard center hole, and (10) for 7″ records with 1½″ center hole.

5. For 7″ or 10″ records, lower the hinged 7/10-inch record support (2) to its rest position on the ejector box (9). For 12-inch records, raise the 7/10-inch record support to a vertical position.

6. Place a stack of records, not to exceed twelve 10-inch or 7-inch records, or ten 12-inch records, not intermixed, over the proper center post. All records must be for the same speed. The records will now rest on the step on the center post and on either of the ears of the ejector box on the ledge of the 7/10-inch record support, depending on the size of records being used and position of 10″ record support.

7. Lower the balance arm (1) to the records; this steadies the records and assures correct dropping of records.

8. Set speed control knob (41) on left-hand side to select proper speed (33, 45, or 78 R.P.M.).

9. Turn the right-hand control knob (24) momentarily to the "Reject" position and release it. This turns the changer on and starts the change cycle, thus dropping the first record to the turntable.

10. To reject a record being played, turn the control knob to "Reject" and release it.

11. To discontinue operation, all records should be dropped to the turntable by repeatedly turning the control knob to the Reject position until all unplayed records have dropped to the turntable. Place the pickup arm on the pickup arm rest and turn the control knob to the "Off" position.

12. To remove the records from the turntable:

a. Raise the balance arm (1) and the 7/10-inch support upward—if the record support is in a hori-

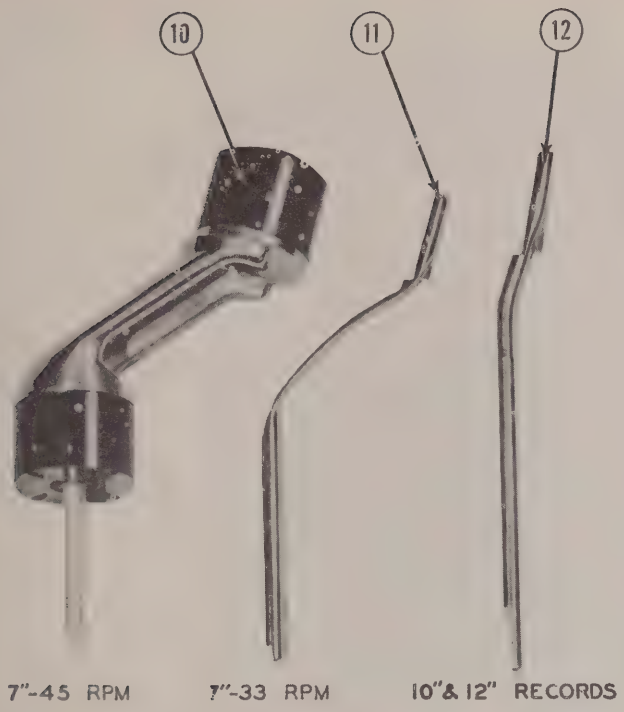


FIGURE 3

zontal position—to permit easy removal of records.

b. Remove center post and lift the records from the turntable.

MANUAL OPERATION

1. Raise the balance arm (1) and the hinged 7/10-inch record support (2) to a vertical position.
2. Place a record on the turntable.
3. Turn the control knob to the "Manual" position. This action starts the rotation of the turntable. The position of the selector lever (102) blocks the movement of the lead bearing pin (32A), thus preventing the changer from cycling.
4. Place the pickup arm on the lead-in groove at the edge of the record.
5. When the record has finished playing, return the pickup arm to the arm rest and turn the control knob to the "Off" position.

THE CHANGE CYCLE

The change cycle may be started by turning the right-hand control button (25) to "Reject." The selector lever (102) then, being pivoted through the action of the notched washer, moves the intermediate selector lever (100) which, in turn, rotates trip lever upper (30) to a position such that gravity trip dog (29A) falls behind the dropping lever (95).

The first revolution of the turntable cam will then rotate the trip arm upper assembly, causing the dropping lever (95) to move away from the lead roller shoulder nut (94) "x."

This allows the lead roller bearing pin (32A) to rise through the action of the compression spring (53) and to enter the spiral of the turntable, thus starting the change cycle.

As the lead roller of the swing arm follows the spiral on the underside of the turntable, the swing arm (104) cam engages the plunger pin (20), thus raising the pickup arm.

The ratchet arm friction springs (77 and 78) engage the ratchet arm (75), swinging the pickup arm out to a position where it is stopped by the ratchet arm contacting the stop bracket (105) figure 4. The swing arm now pushes against the cam roller of the ejector idler lever (52), which, in turn, moves the lower push pin (47), the ejector lever (37), and the 12-inch record slide bolt (4), thus pushing a 12-inch record off the record shelf.

When 7 or 10-inch records are being played, the 12-inch record slide moves forward pushing the 7/10-inch record slide bolt (3), thus dropping a 7 or 10-inch record to the turntable.

As the swing arm nears the end of its swing, the cammed dropping lever (62) comes in contact with the lever trip bracket (66), allowing the return roller pin (32) to rise and enter the spiral groove.

The lead roller pin assembly is pushed back out of the spiral groove of the turntable by the cam surface at the center of the spiral, and is held in position by the flange of the lead roller dropping lever (95). The swing arm is now moved back as the return roller follows the spiral.

The ejector assembly is now returned to its original position.

The pickup arm is moved back toward the record for set down by the friction springs (77 and 78). The pickup arm is stopped in proper position by the engagement of the ratchet arm (75) and the ratchet arm lever (72). The position of the ratchet arm lever is determined by the change lever (68) and the change lever ejector (34), which are operated by the 10-inch record support (2); that is, when 10" and 12" records are being played.

The center post (12), figure 3, used in playing 10" and 12" records, is longer and, when used, engages the discriminator lever (59). This engagement pivots the finger of the lever (59) clear of the ratchet lever (72), thus allowing this engagement of the ratchet arm (75) and lever (72), as described in the preceding paragraph. However, when 7" records are being played (33 or 45 R.P.M.), their spindles are shorter, which allows the discriminator lever (59) to stay in a raised position; therefore, as the tone arm swings in for set down, the ratchet arm lever (72) engages the finger of the discrimi-

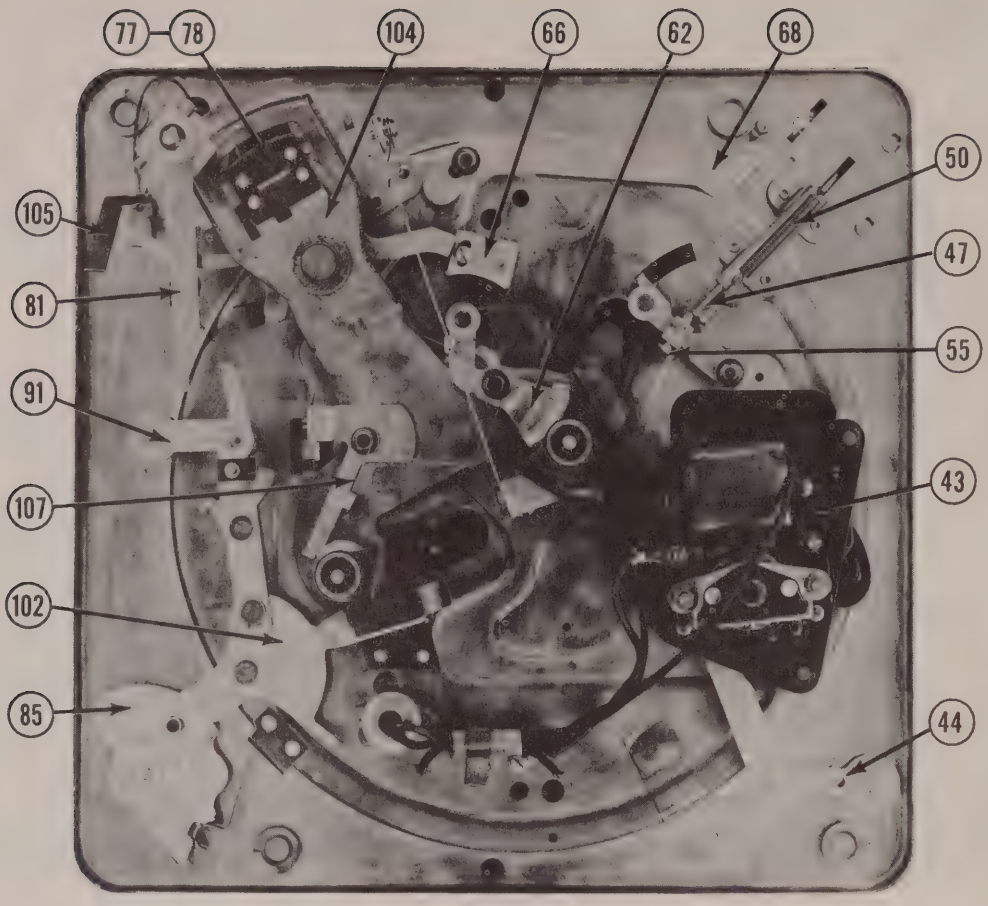


FIGURE 4

nator lever (59), thus positioning the arm for 7" set down.

As the cycle nears completion, the swing arm contacts the brake spring (106), figure 4, which prevents acceleration of the swing arm, thus assuring gentle lowering of the pickup arm to the record as the plunger pin rides down the cam of the swing arm. The friction springs (77 and 78) and the ratchet arm lever (72) are moved away from the ratchet arm through the movement of the swing arm; therefore, the pickup arm is free to move across the record.

The return roller pin assembly is pushed back out of the spiral groove of the turntable by the cam surface at the center of the spiral, and is held in position by the cammed dropping lever (62). This completes the change cycle.

Positive tripping action takes place when the needle moves beyond the recorded area. The trip arm (81), which moves with the pickup arm, moves the lower trip lever (91), which, in turn, drops the trip dog (29A) behind the lead roller drop lever (95) so when the cam on the turntable strikes the upper trip lever (30) it moves the drop lever starting a new cycle.

SERVICE PROCEDURES

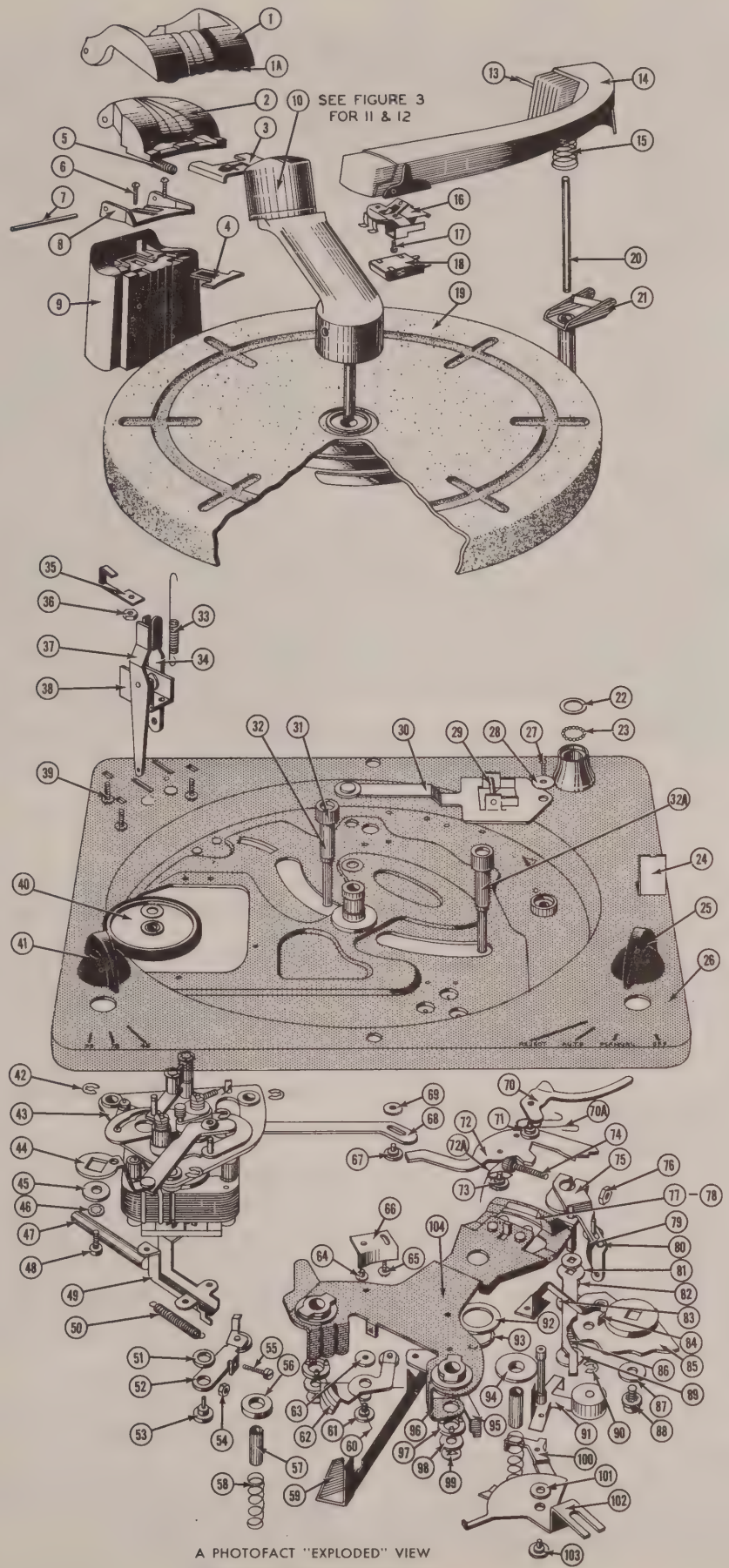
Records Fail to Drop

1. Trip the changer and rotate the turntable, by hand, until the swing arm (104) completes the first half of the cycle:

a. Adjust screw (55) until the 12-inch record slide bolt (4) extends 1/32" past the ears of the ejector box.

b. If 12-inch records fail to drop to turntable, check the ejector arm extension spring (50) to see if it is loose or missing. If loose, or missing, the 12-inch record slide bolt (4) and the ejector lever (37) will stay in a forward position; thereby the ejector mechanism will not be actuated and the records will not be dropped to the turntable.

c. If 7-inch and 10-inch records fail to drop to the turntable, check the 10-inch record support (2) to see if it is completely resting on the ears of the ejector box. Check to see if the ejector compression spring (5) is missing. If this spring is missing, the 10-inch record slide bolt (3) will stay in a forward position.



A PHOTOFACT "EXPLODED" VIEW

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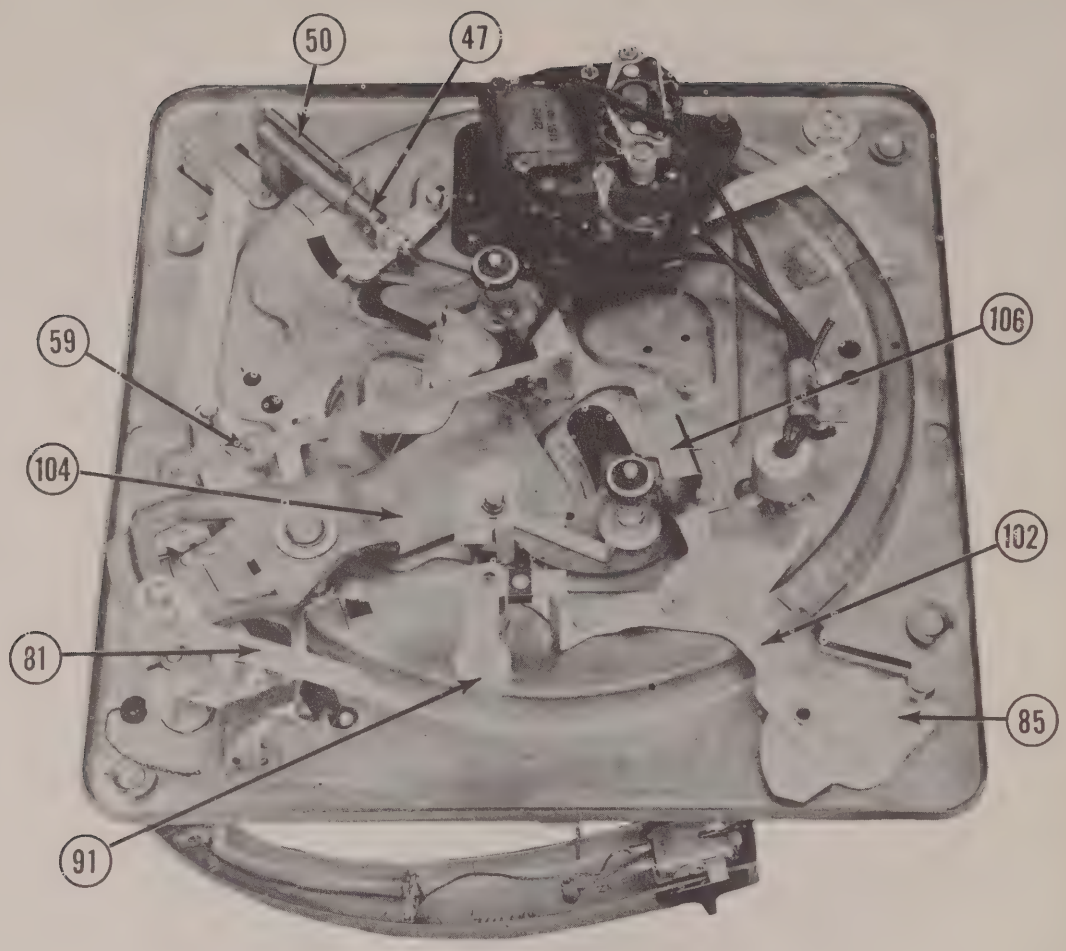

FIGURE 5

If 7″ records fail to shuttle, check to see that two lugs on the record slide bolt (3) protrude approximately .020″ above shelf to engage record.

Pickup Arm Does Not Set Down in Correct Position

1. With the control knob turned to "Off" position, trip mechanism and rotate the turntable, by hand, through the cycle; note where the needle lands. Correction may be made by loosening the clamp screw (74) and moving the pickup arm slightly with respect to the ratchet arm (75). The needle should land approximately ⅛″ from the edge of the record.

2. Check spring (72A) to see if it is missing or too weak to actuate ratchet arm lever (72).

Pickup Arm Drops Fast When Setting Needle on Record

1. Check the friction brake spring (106); it may be weak or broken.

Mechanism Trips Before Record Is Completed

1. The lead roller lever torsion spring (107), figure 4, is loose, allowing lever (95) to slip from beneath the lead roller (32A).

Mechanism Fails to Trip at End of Record

1. Check lever (81) to see if it is making contact with the trip lever (91).

2. Check the compression spring (58). It may be too weak to actuate the lead roller bearing pin assembly, and may not raise it sufficiently to enter the spiral of the turntable. If this is true, the mechanism will not operate when the control knob is turned to Reject.

3. Trip lever (91) binding.

4. Trip dog (29A) binding in an outward position.

5. Spring (86) weak or missing; therefore, the trip arm (81) is not being held in frictional contact with ratchet arm (75).

6. If the above are correct and the changer still

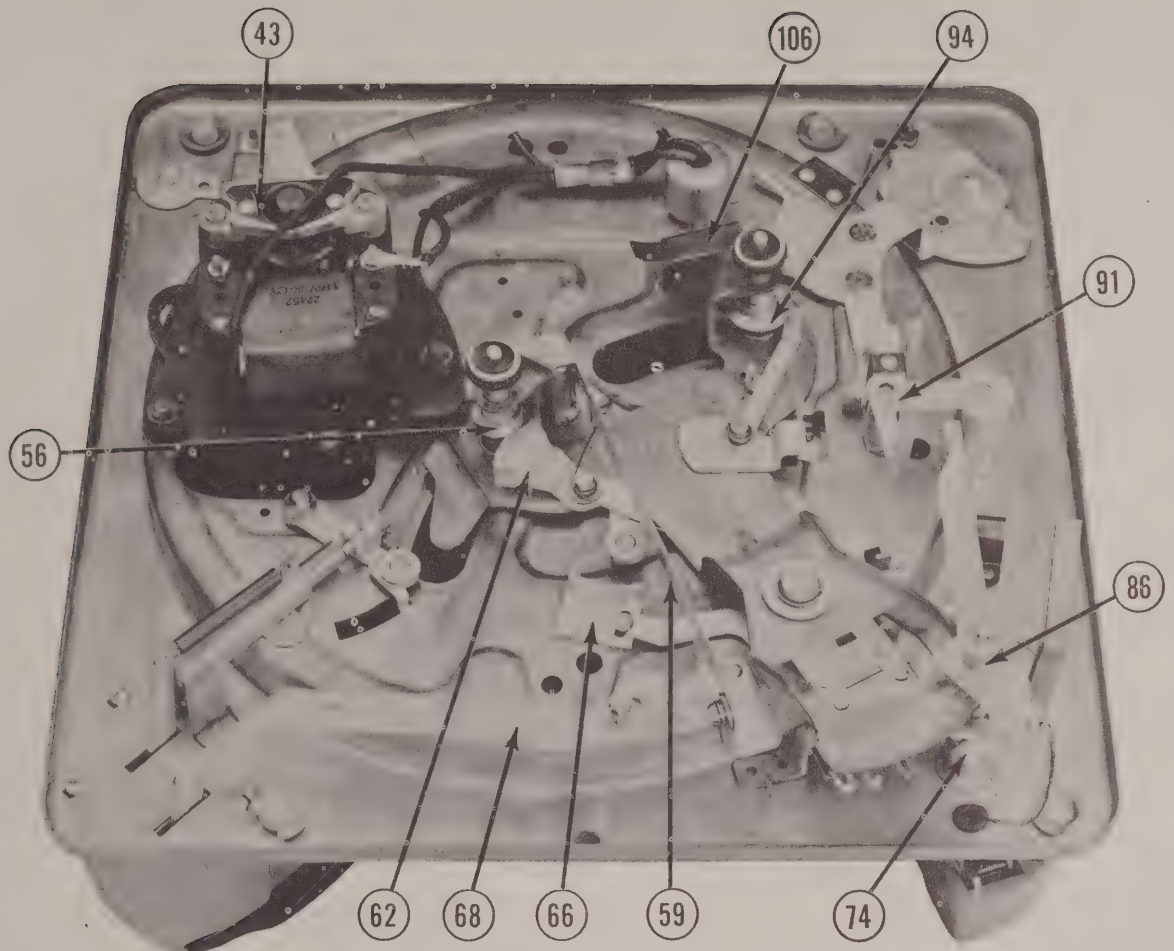

FIGURE 6

does not trip, rotate turntable until turntable cam rotates trip arm (30) to its maximum position. At this point, trip dog (29A) should overlap the edge of lead roller dropping lever (95) by .030″ to .035″. This dimension is very important to the proper operation of the tripping mechanism.

Mechanism Jams in Second Half of Change Cycle

1. Check dropping lever torsion spring (107) to see if it is loose or missing. If this spring is not connected, the dropping lever will not be actuated, thus not holding the roller pin (32A) down when it is pushed down by the cam surface at the center of the spiral of turntable. This allows both rollers in the spiral at the same time, thereby jamming the mechanism.

Clicking of Mechanism and Jamming at the Start of the Change Cycle

1. Check the cammed dropping lever torsion spring (60) to see if it is loose or broken. This will allow both bearing pins to stay in a raised position.

Continuous Cycling

1. Check the selector lever spring (84) to see if it is broken or bent.

Changer Does Not Complete Change Cycle But Turntable Continues to Rotate

1. Check the compression spring (58). If spring is too weak to raise the bearing pin (32) the swing arm will not return to its proper position, thus leaving the pickup arm in an outward and raised position.

Mechanism Fails to Trip When Knob (25) Is Turned to "Reject"

1. Flat spring on trip lever (91) bent or broken, thereby not allowing the intermediate selector lever (100) to contact the spring to move the trip lever (91) when the selector lever (100) is actuated.

PARTS LIST

Ref. No.	Part No.	DESCRIPTION
1	11212-A	Balance arm assembly
1A	11211	Balance arm bumper
2	11424	7-in. and 10-in. record support
3	11422	7-in. and 10-in. record slide bolt
4	11217	12-in. record slide bolt
5	11215	Ejector compression spring
6	11232	No. 4-40 x ⅜ R.H. steel machine screw
7	11223	Ejector box hinge pin
8	11209	Slide bolt cover
9	11208	Ejector box
10	11430	1½-in. spindle assembly—45 R.P.M.
11	11418-A	10-in. and 12-in. center post assembly
12	11425	7-in. spindle assembly
13	11461-C	Pin for yoke
14	11475-D	Tone arm
15	11462-C	Dual tone arm spring
16	10753-EV3	EV cartridge with No. 3-48 screws
17		
18		
19	11480	Turntable assembly
20	11460	Plunger pin
21	11447-A	Swing post assembly
22	11470	.008 x 13/32 x 9/16 ph. bronze washer
23	11450	3/32 dia. ball bearings
24	11419	Arm rest, part of baseplate item 26
25	11203	Control knob
26	11499-C	Mechanism plate
27	10834	No. 4-40 x ¼ steel fil. hd. screw
28	11466	.031 x .125 x ½ steel washer
29	11485	Trip dog pin
29A	11486	Trip dog
30	11487	Trip lever—upper
31	11248	Roller
32	10743	Bearing pin
32A	10743	Bearing pin
33	11216	Balance arm spring
34	11222	Change lever ejector
35	11220	Ejector pressure spring
36	11241	No. 4-40 steel hex nut
37	11218	Finger lever ejector
38	11219	Ejector pivot channel
39	10831	No. 6-32 x ⅜ thread cutting screw
40		Idler wheel—part of item 43
41	11203	Speed control knob
42	11395	No. 16064 E-washer
43	11420	3 speed motor
44	11399GE	Motor repeat lever
45		Steel washer
46	10848	Lockwasher (part of 48)
47	10804	Lower push pin
48	10848	Screw (part of 46)
49	10724	Ejector pin guide
50	10728	Ejector arm ext. spring
51	10782	.102 x .258 x 7/16 brass washer
52	108B-A	Ejector idler lever assembly
53	10781	Lever fulcrum pin
54-55	10792	Adjusting screw and lock nut 6-32 x ⅝
56	10742	Bearing pin shoulder nut
57	10751	Bearing pin spacer
58	10750	Compression spring
59	11437	Discriminator lever
60	10733	Dropping lever tension spring
61	10787	Kickoff lever fulcrum pin
62	10730	Cammed dropping lever
63	10805	.012 x .136 x 7/16 brass slide washer
64	1156	2½/16 tub. riv.
65	10831	No. 6-32 x ⅜ thread cutting screw
66	10811	Lever trip bracket
67	10787	Lever fulcrum pin
68	11236	Change lever
69	10805	.012 x .136 x 7/16 brass slide washer
70	11426	Brake lever
71	10787	Fulcrum pin
72	11436	Ratchet arm lever
72A	11417	Ratchet arm spring
73	10787	Fulcrum pin
74	10837	No. 10-32 x 1 socket head cap screw
75	11415-A	Ratchet arm assembly
76	10810	No. 10-32 steel hex. nut
77	10735	Ratchet arm friction spring
78	10791	Ratchet arm friction spring
79	11428	Ratchet arm spring
80	1156	9/16 tubular rivet
81	11494	Trip arm
82	11468	.031 x .160/.170 x ½ brass washer
83	11492	.060 x .190 x ⅝ steel washer
84	11226	Selector lever spring
85	11225	Notched washer
86	11491	Trip arm compression spring
87	10801	.060 x .190 x ⅝ steel bearing washer
88	10848	No. 10-32 x ⅜ sems screw
89	11492	.060 x .190 sq. x ⅝ steel washer
90	11395	No. 16064 E-washer
91	11482	Trip lever—lower
92	11239	.050 x 33/64 x ⅞ steel washer
93	11240	½ x SC—122 retaining ring
94	11242-F	Flat lead roller shoulder nut
95	11489	Lead roller drop lever
96	10745	Swing arm clamp
97	11244	Roller cushion
98	10801	.060 x .190 x ⅝ steel bearing washer
99	10765	3/16 speed nut
100	11457	Intermediate selector lever
101	10805	.012 x .136 x 3/16 brass slide washer
102	11205	Selector lever
103	10773	Change lever fulcrum pin
104	11490-A	Swing arm assembly
105	11473	Tone arm stop bracket
106	11427	Brake spring (part of base plate 26)
107	11488	Lead roller lever torsion spring

PHOTOFACT* Folder

*TRADE MARK

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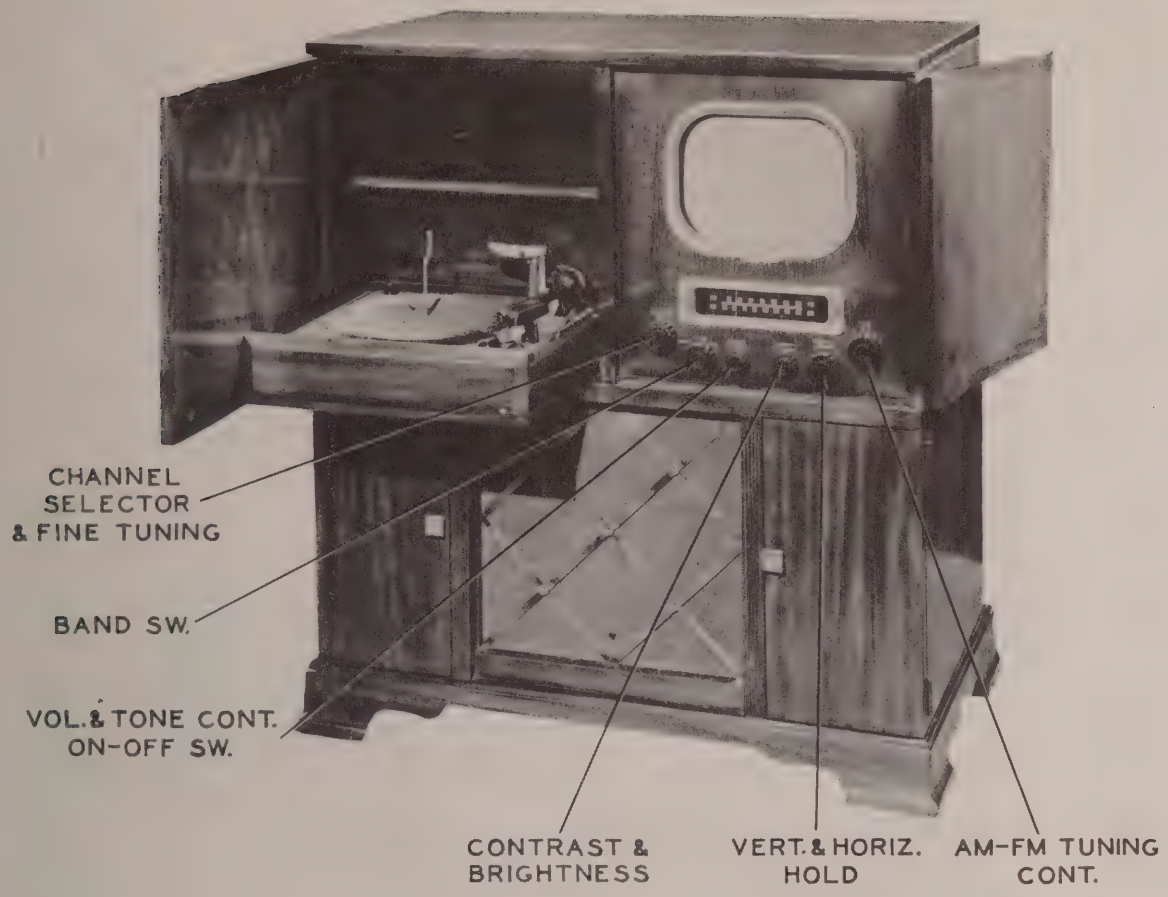

MOTOROLA
VF103, VF103M, (CH. TS-8)

MOTOROLA MODEL VF103

TRADE NAME	Motorola, Models VF103, VF103M (Chassis TS-8)
MANUFACTURER	Motorola Inc., 4545 Augusta Blvd., Chicago 51, Illinois
TYPE SET	AM-FM-TV-Phono Combination Receiver
TUBES	Twenty Five
POWER SUPPLY	110-120 Volts AC-60 Cycle RATING: 2.17 Amp. @ 117 Volts AC
TUNING RANGE—	AM 540-1620KC, FM 88-108MC, TV Channels 2 thru 13.

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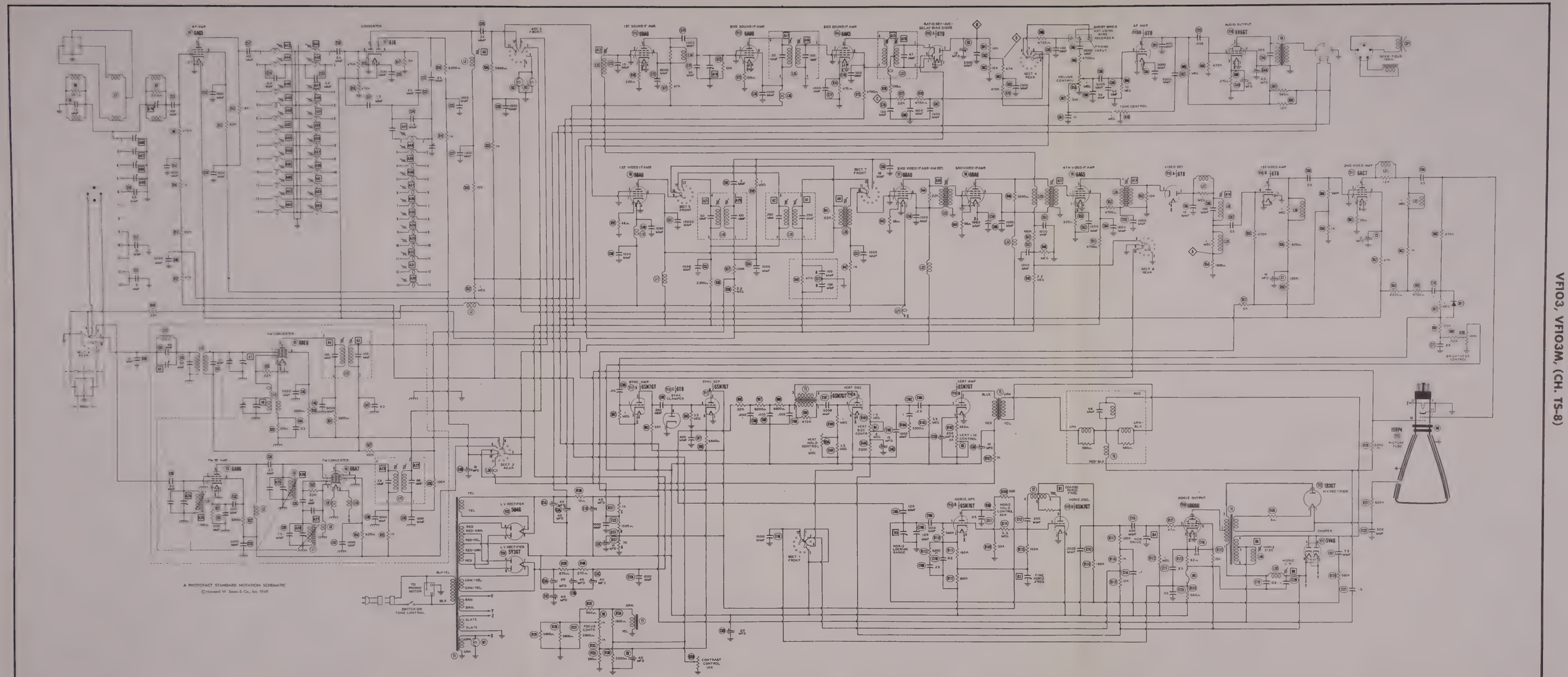
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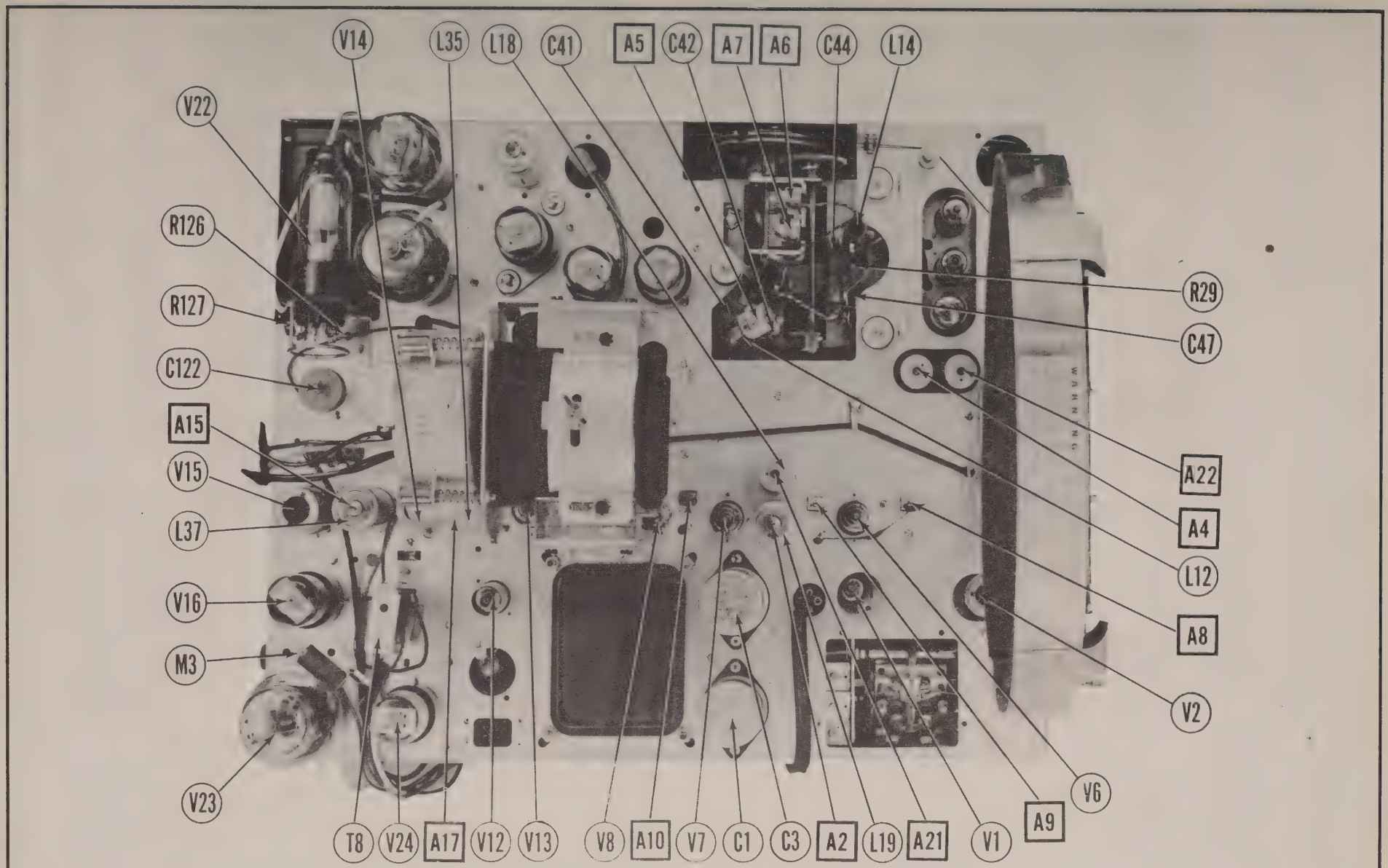
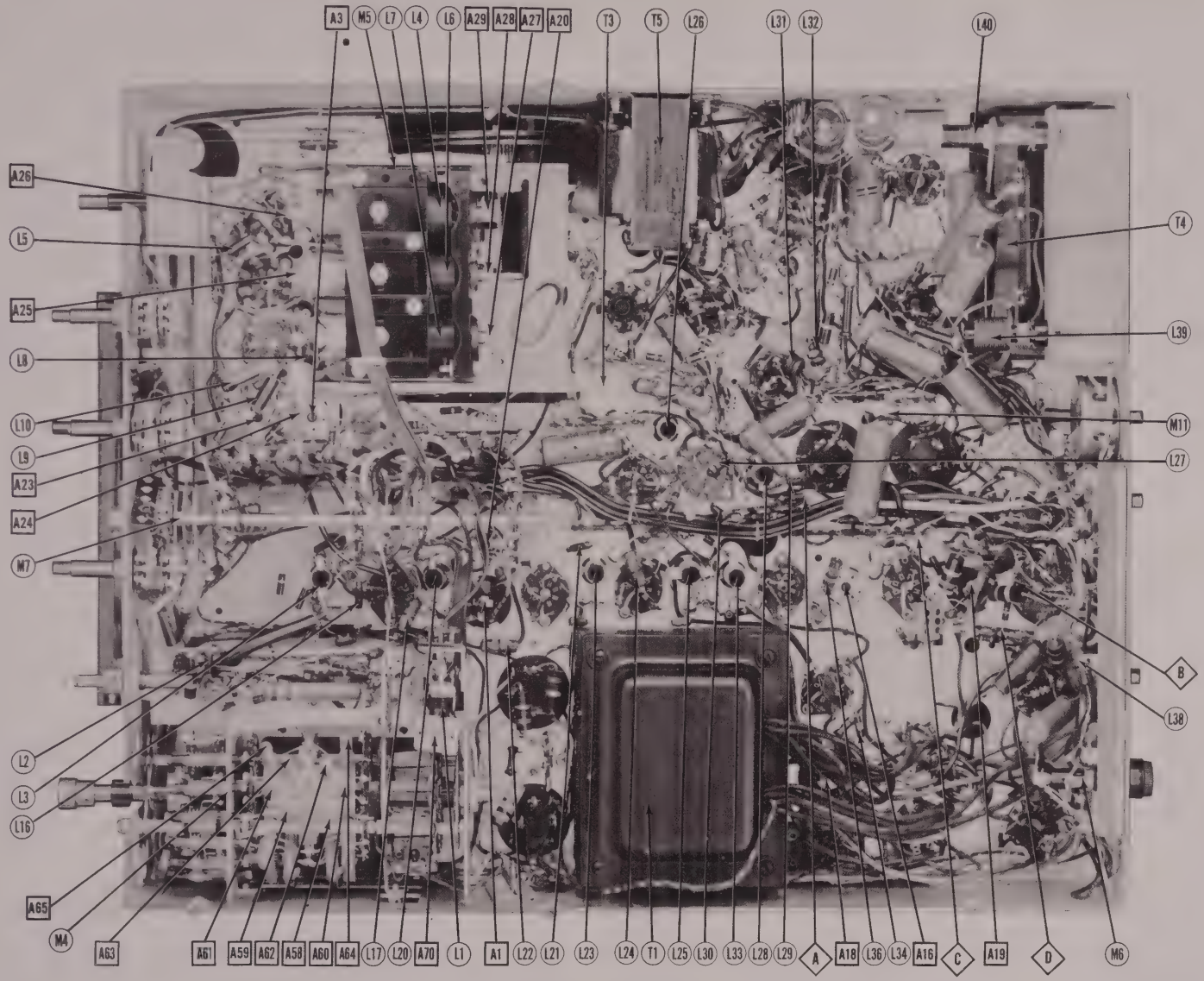


CHASSIS-TOP VIEW



CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

For complete receiver alignment the picture tube must be removed.
The horizontal oscillator tube V19 should be removed to remove high voltage shock hazard.
Care should be exercised when turning adjustments on top of chassis, to avoid contact with filter capacitor cans, as these cans are not at chassis potential.
If complete alignment is required, it is suggested that it be done in the sequence given.

AM ALIGNMENT

To set pointer turn tuning gang fully closed and set pointer to the extreme left hand end of the dial scale.
Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtained an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	.01MFD	High side to pin 7 (Grid) of 6BE6 (V5). Low side to chassis.	455KC (400~ Mod.)	AM (Third pos. clock-wise)	Tuning gang fully closed	Across voice coil	A1,A2, A3,A4	Adjust for maximum output.
2.	200MMF	Across antenna terminals with 200MMF in high side.	455KC (400~ Mod.)	"	"	"	A5	Adjust for minimum output.
3	200MMF	"	1450KC (400~ Mod.)	"	1450KC	"	A6	Adjust for maximum output.
4	200MMF	"	1400KC (400~ Mod.)	"	1400KC	"	A7	Adjust for maximum output.

VIDEO IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Turn the phono, AM, FM, TV switch to TV, (maximum clockwise).
Turn the channel selector to one of the blank positions between channels 2 and 13. This disables the local oscillator to prevent erroneous indications.
Set the contrast control to read -5 volts between the arm (center terminal) and chassis.
Connect the negative lead of a 3 volt battery to the junction of R15 and R16. Connect the positivelead to chassis.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
5	.01MFD	High side to pin 5 (Grid) of 6J6 (V2). Low side to chassis.	23.6MC (Unmod.)	See note above	DC Probe to Point (A) Common to chassis.	A8	Adjust for maximum deflection.
6	.01MFD	"	26.4MC (Unmod.)	"	"	A9	"
7	.01MFD	"	22.9MC (Unmod.)	"	"	A10	"
8.	.01MFD	"	25.7MC (Unmod.)	"	"	A11	"
9	.01MFD	"	21.7MC (Unmod.)	"	"	A12	Adjust for minimum deflection.Repeat step 8.
10	.01MFD	"	24.7MC (Unmod.)	"	"	A13	Adjust for maximum deflection.

4.5 MC TRAP ADJUSTMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
11	.01MFD	High side to pin 2 (Plate) of 6T8 (V10) Low side to chassis.	4.5MC (Unmod.)	Any	DC Probe thru crystal probe (Fig 4) to pin 8 (Plate) of 6AC7 (V11). Low side to chassis.	A14	Adjust for minimum output.

OVERALL VIDEO IF RESPONSE CHECK

Connect the synchronized sweep voltage from the signal generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
12	.01MFD	High side to pin 7 (Grid) of 6J6 (V2). Low side to chassis.	24MC (10MC Sweep)	21.7MC 22.9MC 26.2MC	See note under video IF alignment	Vert. Amp. to Point (A) Low side to chassis.		Check for response as per Fig 1. with markers as shown. If necessary slightly retouch A8 thru A13 for optimum results.

FM & TV SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

The sound trap A12 must be properly adjusted before beginning FM IF alignment. If video IF alignment is not necessary perform step 9 only of video IF alignment before beginning FM IF alignment.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
13	.01MFD	High side to pin 1 (Grid) of 6BA6 (V8). Low side to chassis.	21.7MC (Unmod.)	FM (Second pos. clock-wise)	88MC	DC Probe to Point (B) Common to chassis.	A15, A16, A17, A18	Adjust for maximum deflection. If any adjustment is far off resonance, repeat all adjustments.
14	.01MFD	"	"	"	"	DC Probe to Point (C) Common to Point (D)	A19	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
15	.01MFD	High side to pin 7 of 6BA7 (V4). Low side to chassis.	"	"	"	DC Probe to Point (B) Common to chassis.	A20, A21, A22, A23	Adjust for maximum deflection.

ALIGNMENT INSTRUCTIONS (CONT.)

FM & TV SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

The sound trap A12 must be properly set before beginning FM IF alignment. If video IF alignment is unnecessary, perform step 9 only of video IF alignment before beginning FM IF alignment.

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
13	.01MFD	High side to pin 1 (Grid) of 6AU6 (V13). Low side to chassis.	21.7MC (450KC Sweep)	FM (Second pos. clock-wise)	88MC	Vert. Amp. to Point (B) Low side to chassis.	A15, A16, A17	Disconnect stabilizer capacitor C6. Adjust for maximum amplitude and symmetry as per Fig 2.
14	.01MFD	High side to pin 1 (Grid) of 6BA7 (V4). Low side to chassis.	"	"	"	"	A18, A20, A21, A22, A23	"
15	.01MFD	"	"	"	"	Vert. Amp. to Point (C) Low side to chassis.	A19, A15	Reconnect stablizer capacitor C6. Adjust A19 so 21.7MC marker occurs at center of crossover lines as per Fig 3. Slightly retouch A15 for maximum amplitude and straightness of crossover lines.

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
16	270Ω carbon res.	High side thru 270Ω to ungrounded antenna terminal. Low side to chassis.	90MC (Unmod.)	FM	90MC	DC Probe to Point (B) Common to chassis.	A24, A25, A26	Adjust for maximum deflection.
17	"	"	105MC (Unmod.)	"	105MC	"	A27, A28, A29	Adjust for maximum deflection. Repeat steps 16 and 17 until no further improvement can be made.

TELEVISION OSCILLATOR ALIGNMENT

Turn the Phono, FM, AM, TV switch to TV, (maximum clockwise).

Match the generator output impedance to 300Ω antenna input. If generator has 50Ω output, use a 100Ω resistor in series with high side and 150Ω in series with low side.

If generator has 30Ω output, use a 120Ω resistor in series with the high side and 150Ω in low side.

Set the contrast control to measure -5 volts from contact arm (center terminal) to chassis.

Set the fine tuning to mid-position of its range.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
18	See note above	Across antenna terminals.	59.75MC (Unmod.)	2	DC Probe to Point (C) Common to Point (D)	A30	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
19	"	"	65.75MC (Unmod.)	3	"	A31	"
20	"	"	71.75MC (Unmod.)	4	"	A32	"
21	"	"	81.75MC (Unmod.)	5	"	A33	"
22	"	"	87.75MC (Unmod.)	6	"	A34	"
23	"	"	179.75MC (Unmod.)	7	"	A35	"
24	"	"	185.75MC (Unmod.)	8	"	A36	"
25	"	"	191.75MC (Unmod.)	9	"	A37	"
26	"	"	197.75MC (Unmod.)	10	"	A38	"
27	"	"	203.75MC (Unmod.)	11	"	A39	"
28	"	"	209.75MC (Unmod.)	12	"	A40	"
29	"	"	215.75MC (Unmod.)	13	"	A41	"

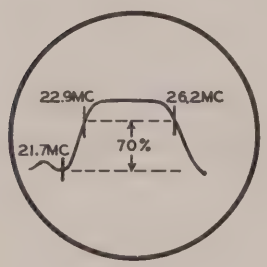


FIG. 1

FIG. 2

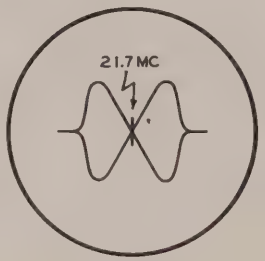


FIG. 3

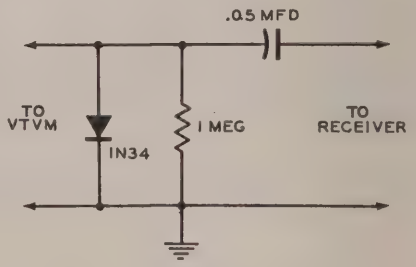


FIG. 4

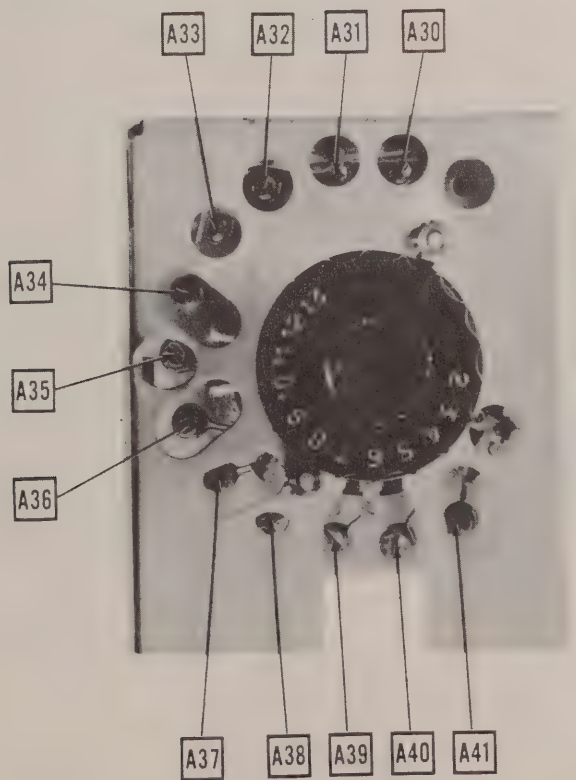
ALIGNMENT INSTRUCTIONS (CONT.)

TELEVISION RF & MIXER ALIGNMENT

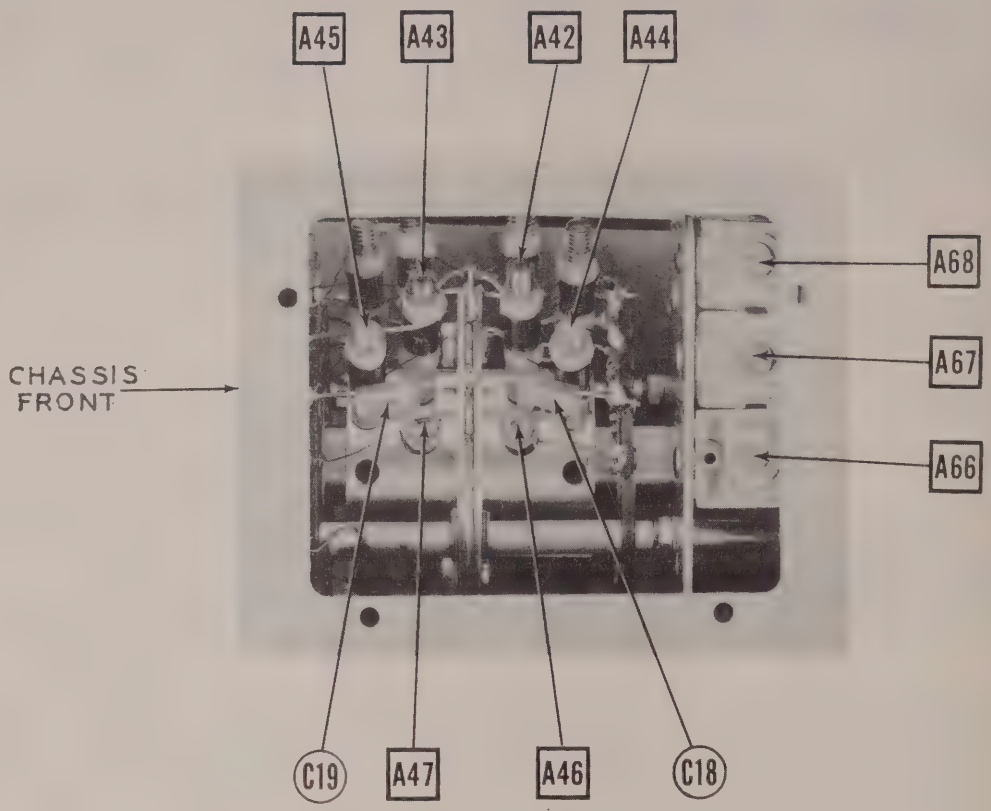
	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
30	See note above - TV oscillator alignment.	Across antenna terminals.	58MC (Unmod.)	2	DC Probe to Point A. Common to chassis.	A42, A43	Detune A42 counterclockwise. Adjust A43 for maximum deflection. Adjust A42 for maximum deflection.
31	"	"	64MC (Unmod.)	3	"	A44, A45	Detune one adjustment counterclockwise. Turn other adjustment for maximum deflection. Adjust detuned adjustment for maximum deflection. Continue this procedure for each channel.
			70MC (Unmod.)	4		A46, A47	
			80MC (Unmod.)	5		A48, A49	
			86MC (Unmod.)	6		A50, A51	
			178MC (Unmod.)	7		A52, A53	
			184MC (Unmod.)	8		A54, A55	
			190MC (Unmod.)	9		A56, A57	
			196MC (Unmod.)	10		A58, A59	
			202MC (Unmod.)	11		A60, A61	
			208MC (Unmod.)	12		A62, A63	
			214MC (Unmod.)	13		A64, A65	

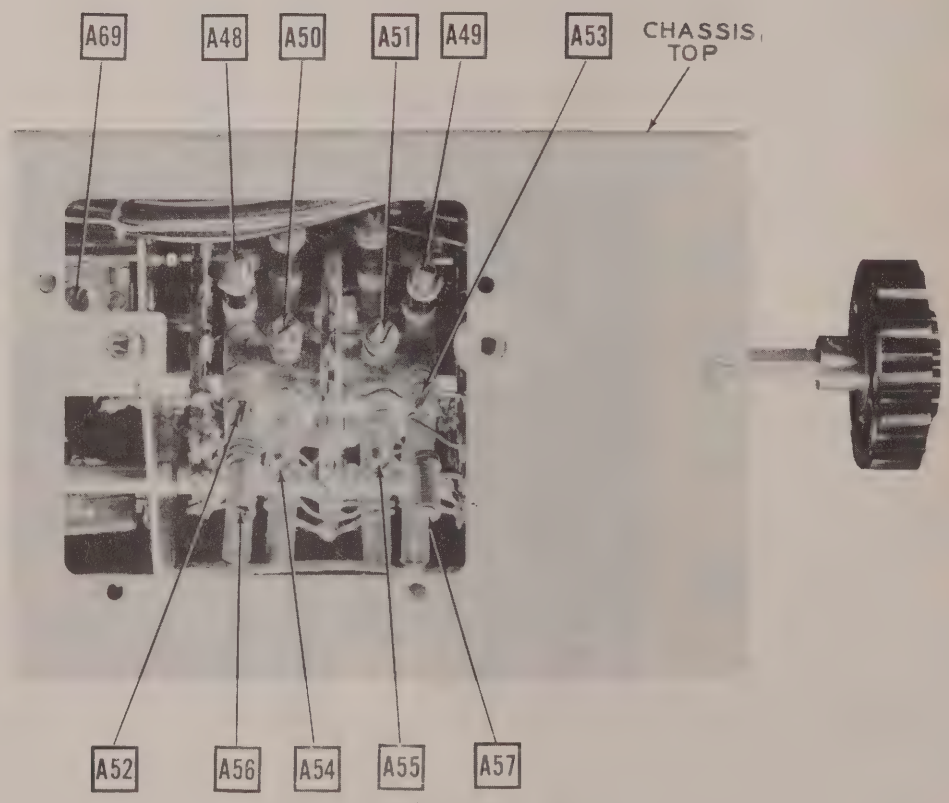
TELEVISION ANTENNA INPUT ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
32	See note above - TV oscillator alignment	Across antenna terminals.	58MC (Unmod.)	2	DC Probe to Point A. Common to chassis.	A66	Adjust for maximum deflection.
33	"	"	64MC (Unmod.)	3	"	A67	"
34	"	"	70MC (Unmod.)	4	"	A68	"
35	"	"	80MC (Unmod.)	5	"	A69	"
36	"	"	195MC (Unmod.)	10	"	A70	"

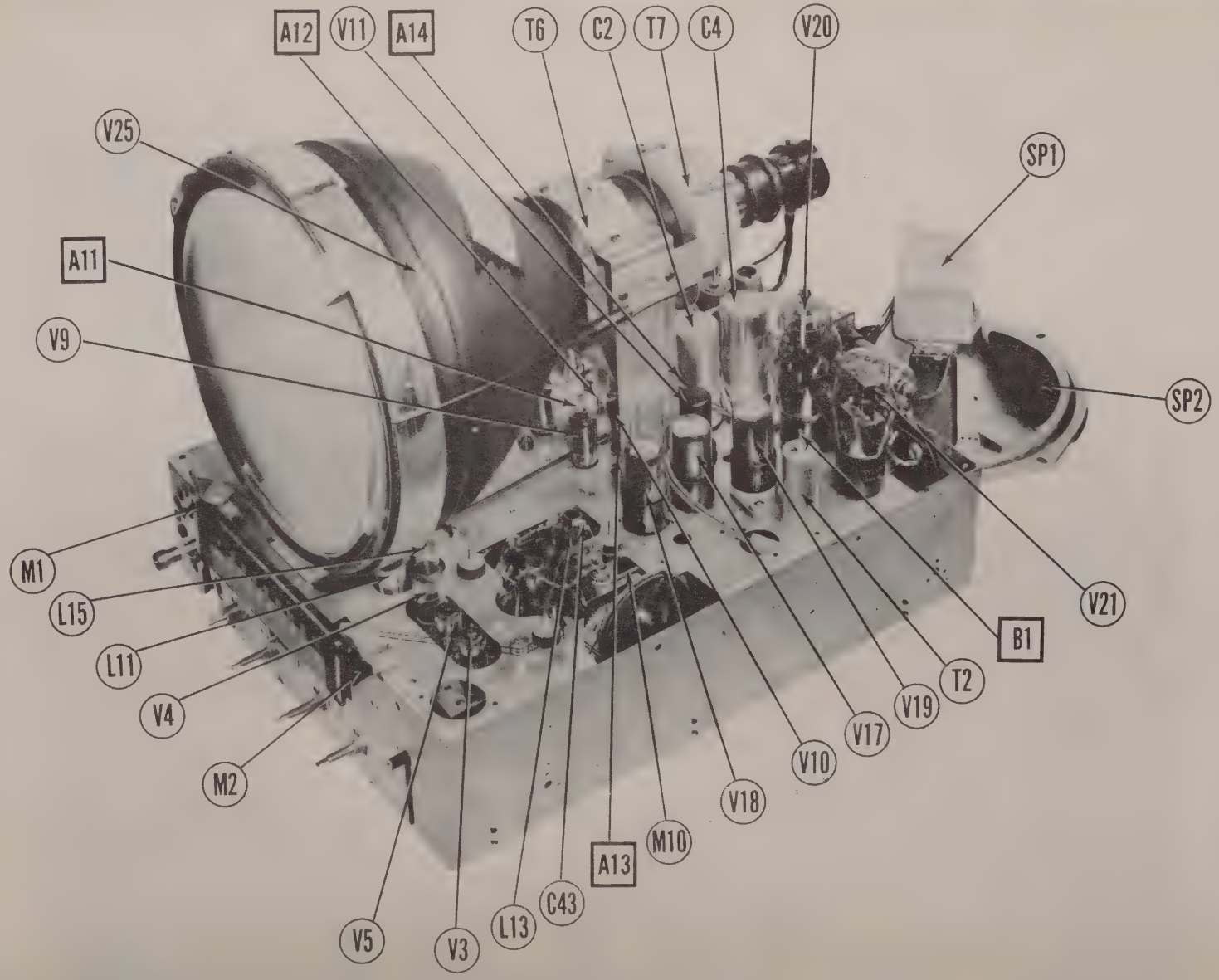


RF TUNER

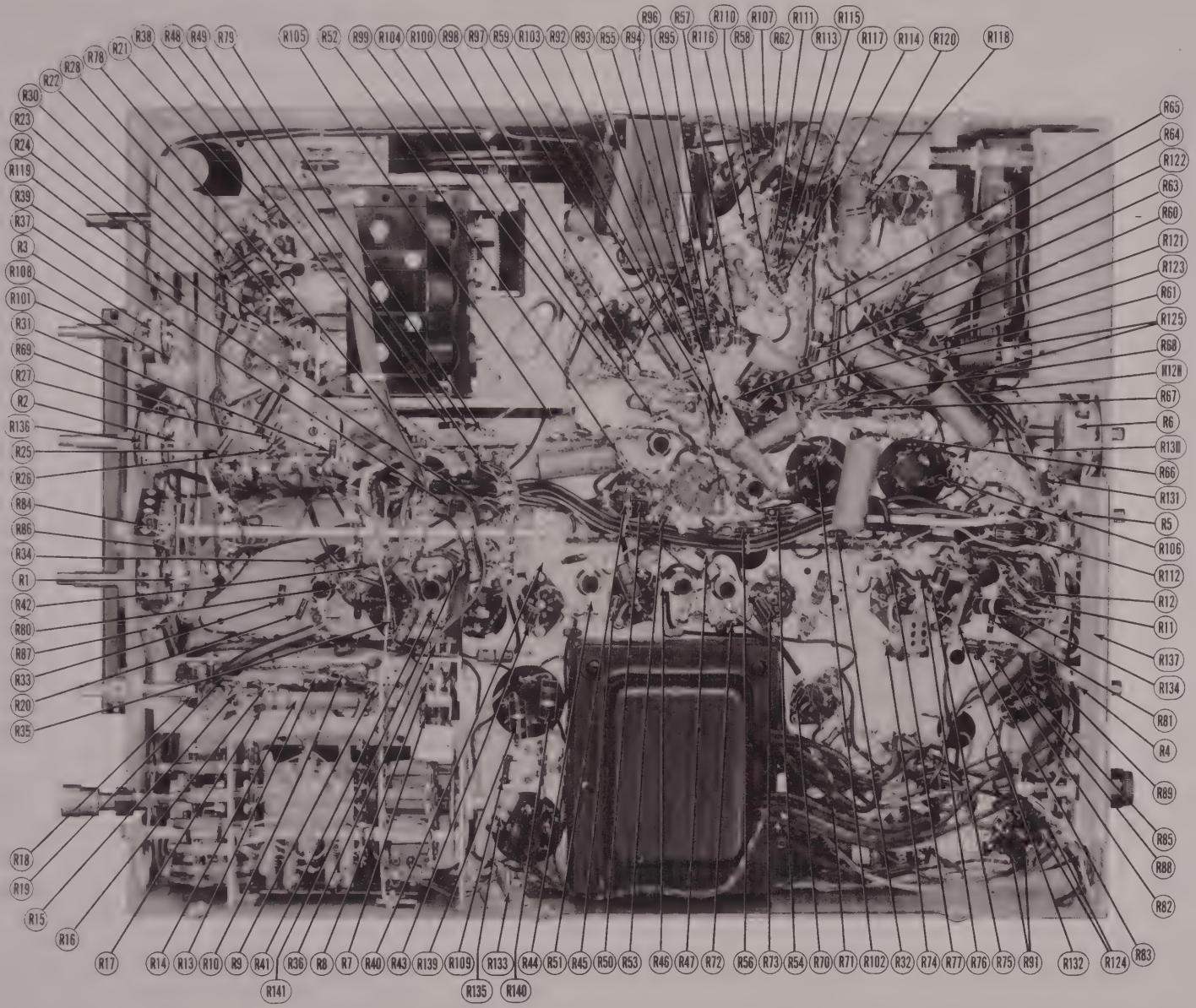

A45
A43
A42
A44
A68
A67
A66
CHASSIS FRONT
C19
A47
A46
C18


A69
A48
A50
A51
A49
A53
CHASSIS TOP
A52
A56
A54
A55
A57

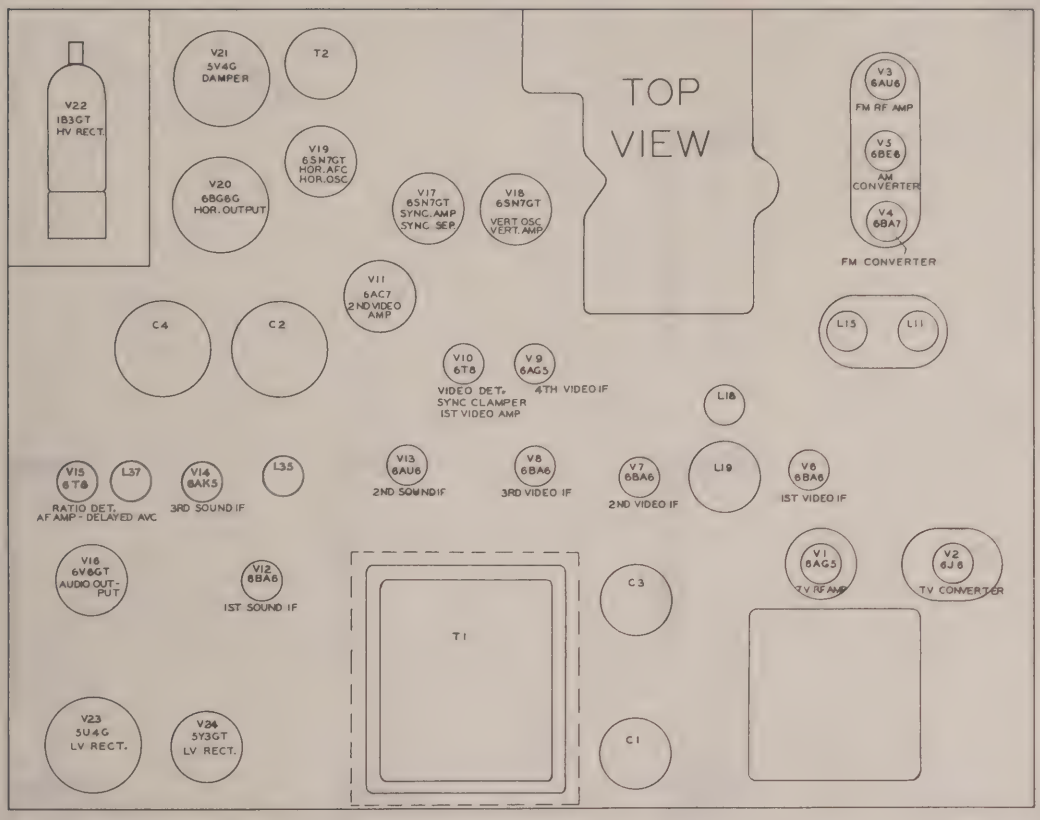
RF TUNER

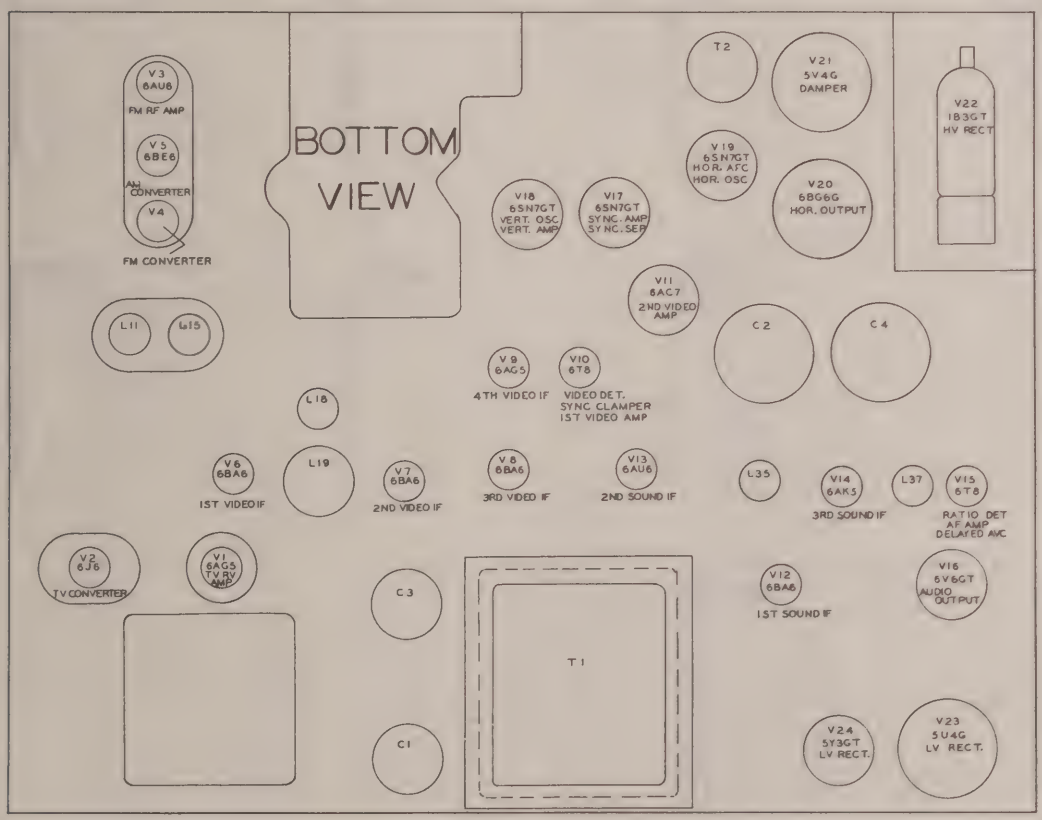


CHASSIS-TOP VIEW

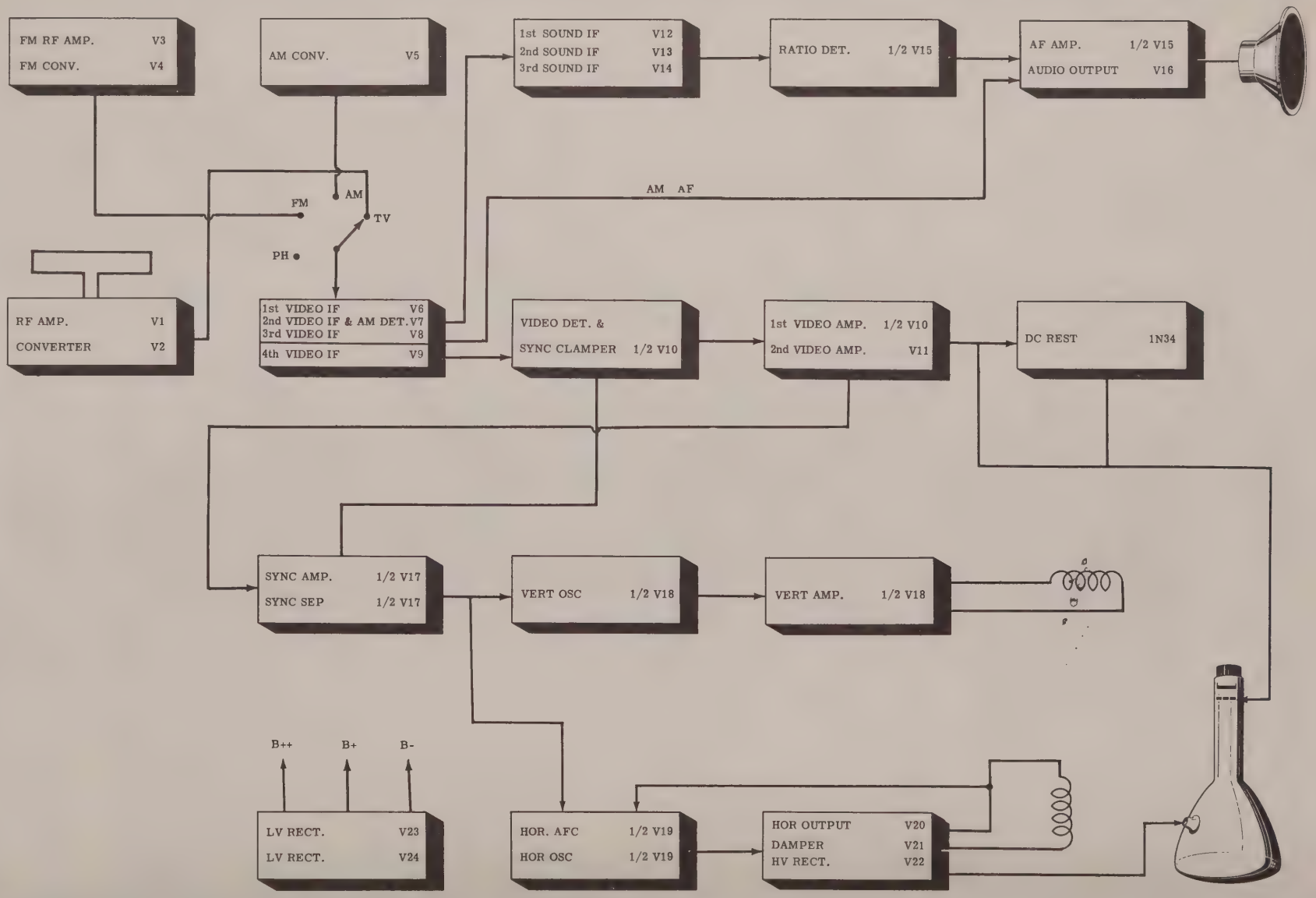


CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION





TUBE PLACEMENT CHART



MOTOROLA

VF 103

BLOCK DIAGRAM

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	NOTES
V1	TV RF Amp.	6AG5	6AG5	7BD	
V2	TV Converter	6J6	6J6	7BF	
V3	FM RF Amp.	6AU6	6AU6	7BK	
V4	FM Converter	6BA7	6BA7	8CT	
V5	AM Converter	6BE6	6BE6	7CH	
V6	1st Video IF Amp.	6BA6	6BA6	7BK	
V7	2nd Video IF Amp.-AM Det.	6BA6	6BA6	7BK	
V8	3rd Video IF Amp.	6BA6	6BA6	7BK	
V9	4th Video IF Amp.	6AG5	6AG5	7BD	
V10	Video Det.-1st Video Amp.-Sync. Clamper	6T8	6T8	9E	
V11	2nd Video Amp.	6AC7	6AC7	8N	
V12	1st Sound IF Amp.	6BA6	6BA6	7BK	
V13	2nd Sound IF Amp.	6AU6	6AU6	7BK	
V14	3rd Sound IF Amp.	6AK5	6AK5	7BD	
V15	Ratio Det.-AF Amp.-AVC-Delay Bias Diode	6T8	6T8	9E	
V16	Audio Output	6V6GT	6V6GT	7AC	
V17	Sync. Amp.-Sync. Sep.	6SN7GT	6SN7GT	8BD	
V18	Vert. Osc.-Vert. Amp.	6SN7GT	6SN7GT	8BD	
V19	Hor. AFC.-Hor. Osc.	6SN7GT	6SN7GT	8BD	
V20	Hor. Output	6BG6G	6BG6G	5BT	
V21	Damper	5V4G	5V4G	5L	
V22	HV Rectifier	1B3GT	1B3GT	3C	
V23	LV Rectifier	5U4G	5U4G	5T	
V24	LV Rectifier	5Y3GT	5Y3GT	5T	
V25	Picture Tube	10BP4	10BP4	12D	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA: MOTOROLA PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	40	450	23A484197	AFH88J8D	UP11CJ		TVL-54	■ Filter
B	40	450			1067			◓ Filter
C	40	150						▲ Filter
C2A	40	450	23A484196	AFH822J50A	UP9DJ			◓ Filter
B	10	450			1068			■ Vert. Output Dec.
C	10	450						▲ Filter
D	250	25						Vert. Output Cath. Byp.
C3A	40	300	23A484194	AFH88G4D	UP9DJ			■ Filter
B	40	300			1070			◓ Filter
C	40	300						▲ Filter
D	20	150						Filter
C4A	40	450	23A484195	AF832J5A	UP9DJ			◓ Filter
B	10	450			1069			▲ Filter
C	15	450						■ Vert. Osc. Decoupling
D	25	25						Output Cath. Bypass
C5	10	450	23K489031	AFH2J	BR1045		TVA-21	V. Output Screen Bypass
C6	10	50	23A90205	PRS50/10	BR105		TVA-14	Stabilizing Cap.
C7	10	450	23K489030	AFH2J	BR1045		TVA-21	V. Amp. Decoupling
C8	40	150	23A485454	PRS150/40	BR4015		UT-401	Bias Filter
C9	7.5		21C470735					Fixed Trimmer
C10	3.3		21A489052			NPOK-3.3		Fixed Trimmer
C11	15	500	21R2736			GP1K-15	MS-415	Fixed Trimmer
C12	15	500	21R2736			GP1K-15	MS-415	Fixed Trimmer
C13	100		21K470736			GP1K-100		RF Coupling
C14	1000		21K478410			GP2L-001		Bias Filter
C15	1000		21K478410			GP2L-001		RF Screen Bypass
C16	1000		21K478410			GP2L-001		RF Bypass
C17	100		21K470736			GP1K-100		RF Coupling
C18	2.2		21K489053					Fixed Trimmer
C19	2.2		21K489053					Fixed Trimmer
C20	25		21A470738			GP1K-25		RF Coupling
C21	1.5		21K482296			NPOK-1.5		Osc. Coupling
C22	25		21A470738			GP1K-25		Osc. Grid Cap.
C23	25		21A470738			GP1K-25		Osc. Feedback
C24	1.5		21A780121					Fixed Trimmer
C25	1000		21K478410			GP2L-001		Osc. Plate Decoupling
C26	1000		21K478410			GP2L-001		Mixer Fil. Bypass
C27	1000		21K478410	1468-001	1W5D1	GP2L-001	1FM-21	Mixer Plate Dec.
C28	25		21A470738	1468-000025	5W5Q25	GP1K-25	MS-425	IF Coupling
C29	1000		21K478410	1468-001	1W5D1	GP2L-001	1FM-21	Bias Filter
C30	3.3		21K77268			NPOK-3.3		RF Coupling
C31	1000		21K478410	1468-001	1W5D1	GP2L-001	1FM-21	FM RF Cath. Bypass
C32	1000		21K478410	1468-001	1W5D1	GP2L-001	1FM-21	FM RF Screen Bypass
C33	5000		21A470789	1467-005	1D5D5	811-005	29C1	RF Bypass
C34	25		21K28816	1468-000025	5W5Q25	GP1K-25	MS-425	RF Coupling
C35	50		21K55003	1468-00005	5W5Q5	GP1K-50	1FM-45	FM Osc. Grid Cap.
C36	7.5		21C470735					Fixed Trimmer
C37	1000		21K478410	1468-001	1W5D1	GP2L-001	1FM-21	FM Osc. Anode Bypass
C38	5000		21A470789	1467-005	1D5D5	811-005	29C1	FM Conv. Plate Dec.
C39	1000		21K478410	1468-001	1W5D1	GP2L-001	1FM-21	AVC Filter
C40	10		21A101778	1469-00001	5R5Q1	N750K-10	MS-41	Fixed Trimmer
C41	68		21K471128			GP1K-68	MS-47	Fixed Trimmer
C42	150		21K54876	1469-00015	5R5T15	NPO-334-150	MS-150	Fixed Trimmer
C43	10		21K77115	1469-00001	5R5Q1	NPOK-10	MS-41	Fixed Trimmer
C44	.03	400	8K471165	P488-03	GT4S3		TM-13	Conv. Cath. Bypass
C45	5000		21A470789	1467-005	1D5D5	811-005	29C1	Osc. Anode Bypass

PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS (CONT.)

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA MOTOROLA PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C46	5000		21A477939	146F-005	1D5D5	811-005	29C1	Conv. Plate Dec.
C47	.03	400	8K471165	P488-03	3T4S3		TM-13	AVC Filter
C48	5000		21A477939	146F-005	1D5D5		29C1	Bias Filter
C49	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	Filament Bypass
C50	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	" "
C51	10000		21K482726	P488-01	3T6S1	SC1-01	36C1	1st V. IF Decoupling
C52	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	" " "
C53	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	Bias Filter
C54	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	AVC Filter *
C55	5		21K486819	146B-000005	5W5V5	NN5A-5	MS-55	RF Coupling
C56	10		21A1017778	146B-00001	5R5Q1	N750A-100	MS-41	Fixed Trimmer
C57A	100		†	146B-0001	5W5T1	GP1K-100	1FM-31	Diode RF Filter
B	100			146B-0001	5W5T1	GP1K-100	1FM-31	" " "
C58	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	2nd V. IF Decoupling
C59	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	3rd V. IF Fil. Bypass
C60	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	3rd V. IF Decoupling
C61	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	AVC Filter
C62	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	" "
C63	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	4th V. IF Cath. Bypass
C64	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	4th V. IF Decoupling
C65	10		21A1017778	146B-00001	5W5Q1	GP1K-10	MS-41	V. Diode Filter *
C66	100		21K482624	146B-0001	5R5T1	N750L-100	MS-31	Fixed Trimmer
C67	.05	100	8K471166	P488-05	3T4S5		TM-15	Video Coupling
C68	.05	400	8K471167	P488-05	3T4S5		TM-15	" "
C69	.05	400	8A471149	P488-05	3T4S5		TM-15	" "
C70	.1	600	8A471149	P488-1	3T6P1		TM-1	" "
C71	.25	400	5A471356	P488-25	3T4P25		TC-2	Brightness Cont. Bypass
C72	15		21K478028				MS-415	Fixed Trimmer
C73	.0001		21A482726	P688-01	3T6S1	821-01	36C1	1st S. IF Decoupling
C74	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	S. IF Coupling
C75	65		21K478375	146B-00065	5R5Q5	NP05M-50	MS-45	Fixed Trimmer
C76	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	2nd S. IF Decoupling
C77	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	3rd S. IF Cath. Bypass
C78	500	500	21K486902	146B-0005	5W5T5	GP2K-500	1FM-35	3rd S. IF Decoupling
C79	150	500	21K486901	146B-00015	5W5Q5	GP2K-150	1FM-315	Diode Load Cap.
C80	1500		21K478334	146F-00015	1W5D15	GP2L-00015	1FM-215	De-emphasis
C81	1500		21K478334	146F-00015	1W5D15	GP2L-00015	1FM-215	" "
C82	5000		21A477939	146F-005	1D5D5	811-005	29C1	RF Bypass
C83	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	AVC Filter
C84	5000		21A477939	146F-005	1D5D5	811-005	29C1	Ratio Det. Fil. Byp.
C85	1M		21K482624	146B-001	5R5T1	GP1K-100	1FM-31	RF Bypass
C86	10000		21A482726	P688-01	3T6S1	821-01	36C1	Audio Coupling
C87	.01	100	8K471165	P488-01	3T3S1	GP1-335-01	TM-11	Tone Comp.
C88	.5		21A477939	146F-005	1W5Q5	GP1K-50	1FM-45	RF Bypass
C89	5000		21A477939	146F-005	1D5D5	811-005	29C1	Audio Coupling
C90	.05		21A477167	146B-00005	5W5Q5	GP1K-50	1FM-45	AF Grid Bypass
C91	390	500	21K486841	146B-0004	5W5T4	GP2K-390	1FM-34	AF Plate Bypass
C92	5000		21A477939	146F-005	1D5D5	811-005	29C1	Tone Comp.
C93	.005	600	8K471162	P688-005	3T6D5	GP2M-005	TM-25	Audio Coupling
C94	.005	600	8K471162	P688-005	3T6D5	GP2M-005	TM-25	Output Plate Bypass
C95	.05	400	8A471151	P688-05	3T4S5		TM-15	Sync. Coupling
C96	250		21K486841	146B-00025	5W5T25	GP2K-250	1FM-325	" "
C97	390	500	21K486841	146B-0004	5W5T4	GP2K-390	1FM-34	Sync. Sep. Cath. Byp.
C98	.005	600	8K471162	P688-005	3T6D5	GP2M-005	TM-25	Integrator Net.
C99	.005	600	8K471162	P688-005	3T6D5	GP2M-005	TM-25	" " "
C100	.005	600	8K471162	P688-005	3T6D5	GP2M-005	TM-25	" " "
C101	.005	600	8K471162	P688-005	3T6D5	GP2M-005	TM-25	" " "
C102	5000		21A477939	146F-005	1D5D5	811-005	29C1	Vert. Osc. Grid Cap.
C103	.1	400	8K471165	P488-1	3T4P1		TM-1	Vert. Discharge
C104	1500		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	" "
C105	.25	400	5K474148	P488-25	3T4P25		TC-2	Vert. Sweep Coupling
C106	120		21K486840				GP2K-120	Hor. Sync. Coupling
C107	150		21K486901				GP2K-150	Voltage Divider
C108	.1		21C477736					AFC Feedback
C109	1500		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	Hor. Sync. Coupling
C110	.25	200	5K474156	P488-25	3T4S25		TC-2	AFC Filter
C111	.02	100	8K471164	P488-2	3T3S2		TM-12	" "
C112	.05	200	8K471168	P488-05	3T3S5		TM-15	AFC Plate Bypass
C113	25	500	21K486842	146B-00025	5W5T25	GP2K-250	1FM-325	Hor. Osc. Grid Cap.
C114	2000	600	21K478411	146F-002	1W5D2	GP2N-002	1FM-22	Hor. Discharge
C115	.1	600	8A471149	P688-1	3T6P1		TM-1	" "
C116	390	500	21K486841	146B-0004	5W5T4	GP2K-390	1FM-34	Hor. Sweep Coupling
C117	.05	600	8A471151	P688-05	3T3S5		TM-15	Hor. Output Screen Bypass
C118	.25	200	8A471356	P488-25	3T4P25		TC-2	Hor. Output Cath. Bypass
C119	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	RF Bypass
C120	.03	1000	8K790430	P1088-03	GT16S3		MB-13	Damper Filter
C121	.1	600	8A471149	P688-1	3T6P1		TM-1	" " "
C122	.25	100	8K790158	P688-S	3T2P5		TC-S	Hor. Sweep Coupling
C123	500	10000	21A50013					HV Filter
C124	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	RF Bypass
C125	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-21	" "
C126	.25	400	5K471257	P488-25	3T4S25		TM-15	" " "
C127	1000		21K478410	146B-001	1W5D1	GP2L-001	1FM-2	4th Video IF Plate Decoup.*

* Not used in all models.
† Items C57A, C57B, and R40 are combined into one unit obtainable under MFGR'S Part No. 21A473040

CONTROLS

ITEM No	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA MOTOROLA PART No.	IRC PART No.	CLAROSTAT PART No.	INSTALLATION NOTES
R1A	1 Meg.	½	19K489005			Volume control, tapped @ 250K (Dual Concentric)
B	1 Meg.	½				Tone control and switch
R2A	10K	½	19A484072			Contrast control (Dual Concentric)
B	10K	½				Brightness control
R3A	1 Meg.	½	19A484073			Vert. hold control (Dual Concentric)
B	50K	½				Horiz. hold control
R4	2 Meg.	½	19A484196	411-139	M-33-S	Vert. size control
R5	5000	½	19A484600	411-114	M-19-S	Vert. linearity control
R6	1000	½	19K789354		10-1000	Focus control (Wire Wound)

RESISTORS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA MOTOROLA PART No.	IRC PART No.	IDENTIFICATION CODES ALL RESISTORS ARE ± 10% UNLESS OTHERWISE STATED
R7	220Ω	½	6R6270		Ant. Coil Shunt
R8	390Ω	½	6R5554		" " "
R9	470KΩ	½	6R6377		RF Grid
R10	100Ω	½	6R6629		Bias Network
R11	100KΩ	½	6R6378		" "
R12	47KΩ 20%	½	6R6056		1st V. IF Decoupling
R13	82KΩ	1	6R5575		RF Screen
R14	18KΩ	2	6R476014	BT-2-18K	RF Plate
R15	470KΩ	½	6R6377		Conv. Grid
R16	470KΩ	½	6R6377		" "
R17	15KΩ 20%	1	6R2119		Osc. Grid
R18	820Ω	1	6R5610		Osc. Plate
R19	1000 20%	½	6R6301		Osc. Plate Decoupling
R20	15KΩ 20%	½	6R2119		Conv. Plate Decoupling
R21	100Ω 20%	½	6R6018		FM RF Cathode
R22	3300Ω 20%	½	6R6036	BTS-3300	FM RF Screen
R23	22KΩ 20%	½	6R6028	BTS-22K	FM Osc. Grid
R24	820Ω	½	6R6269	BTS-820	FM Osc. Anode
R25	100Ω	½	6R6301	BTS-100	FM Conv. Decoupling
R26	100Ω 20%	½	6R6075	BTS-100K	AVC Network
R27	100KΩ 20%	½	6R6075	BTS-100K	" "
R28	22KΩ 20%	½	6R6028	BTS-22K	AM Osc. Grid
R29	120Ω 20%	½	6R5581	BW-½-120	AM Conv. Cathode
R30	3300Ω 20%	½	6R6036	BTS-3300	AM Osc. Anode
R31	3300Ω 20%	½	6R6036	BTS-3300	AM Conv. Decoupling
R32	1 Meg.20%	½	6R6004	BTS-1 Meg.	Bias Network
R33	100Ω	½	6R6229	BTS-1000	" "
R34	5600Ω	2	6R6117		1st Video IF Grid
R35	68Ω 20%	½	6R6007		1st Video IF Cathode
R36	220Ω	½	6R6290	BTS-2200	1st FM IF Decoupling
R37	100KΩ	½	6R6031	BTS-100K	AVC Network
R38	2.2 Meg.	½	6R6433	BTS-2.2 Meg.	" "
R39	1 Meg.20%	½	6R6004	BTS-1 Meg.	" "
R40	47KΩ	½	†	BTS-47K	RF Filter
R41	22KΩ	½	6R6397		1st Video IF Transformer Shunt
R42	100Ω	½	6R6229		Bias Network
R43	68Ω 20%	½	6R6007		2nd Video IF Cathode
R44	22KΩ	½	6R6397		2nd Video IF Transformer Shunt
R45	68Ω 20%	½	6R6007		3rd Video IF Cathode
R46	330Ω	½	6R6581	BTS-3300	3rd Video IF Transformer Shunt
R47	100KΩ	½	6R6031		1st Sound IF Grid
R48	1 Meg.	½	6R6004	BTS-1 Meg.	Voltage Divider
R49	2.2 Meg.	½	6R6433	BTS-2.2 Meg.	AVC Network
R50	2200 20%	½	6R3933		4th Video IF Cathode
R51	470Ω	½	6R6090		4th Video IF Screen
R52	4700Ω	½	6R6080		4th Video IF Plate
R53	10KΩ	½	6R6320		4th Video IF Transformer Shunt
R54	1800Ω	½	6R2089	BTS-1800	Video Det. Load
R55	470KΩ	½	6R6377	BTS-470K	Video Amp. Grid
R56	1800Ω	½	6R2089	BTS-1800	Video Amp. Plate
R57	10KΩ	½	6R6320	BTS-10K	Bias Network
R58	120KΩ	½	6R5631	BTS-120K	Filter
R59	1000Ω	½	6R6229	BTS-1000	Voltage Divider
R60	560KΩ	½	6R5697	BTS-560K	2nd Video Amp. Grid
R61	39Ω	½	6R2085	BW-½-39	2nd Video Amp. Cathode
R62	47KΩ 20%	½	6R6056	BTS-47K	Filter
R63	1000Ω	1	6R6527	BTA-1000	2nd Video Amp. Plate
R64	2200Ω	1	6R5687	BTA-2200	" " " "
R65	4700Ω 20%	½	6R6039	BTS-4700	Phase Correction
R66	470KΩ	½	6R6377	BTS-470K	Picture Tube Grid
R67	1 Meg. 20%	½	6R6004	BTS-1 Meg.	DC Rest. Det. Load
R68	100KΩ	½	6R6031	BTS-100K	Voltage Divider
R69	150KΩ	½	6R6398	BTS-150K	" "
R70	2200Ω 20%	½	6R3933		1st Sound IF Cathode
R71	47KΩ 20%	½	6R3056		1st Sound IF Decoupling
R72	33KΩ	½	6R3410		2nd Sound IF Grid
R73	1000 20%	½	6R3018		2nd Sound IF Cathode
R74	470Ω	½	6R3090		3rd Sound IF Cathode
R75	4700Ω	½	6R5671		3rd Sound IF Decoupling
R76	1000 20%	½	6R6018		Balancing
R77	22KΩ	½	6R6397	BTS-22K	De-emphasis
R78	4700Ω	½	6R6039	BTS-4700	"
R79	470KΩ	½	6R6377	BTS-470K	AVC Network
R80	4700Ω	½	6R6080	BTS-4700	De-emphasis
R81	10KΩ	½	6R6320	BTS-10K	Ratio Det. Diode Load
R82	10KΩ	½	6R6320	BTS-10K	" " "
R83	47KΩ	½	6R6056	BTS-47K	AVC Network
R84	10 Meg.20%	½	6R2109	BTS-10 Meg.	AF Grid
R85	1 Meg. 20%	½	6R6004	BTS-1 Meg.	AF Plate
R86	4700Ω 20%	½	6R6039	BTS-4700	Tone Compensation
R87	33KΩ	½	6R6410	BTS-33K	Tone Compensation
R88	470KΩ	½	6R6377	BTS-470K	Output Grid
R89	270Ω	2	6R476116	BW-2-270	Output Cathode
R90	12KΩ	1	6R5656	BTA-12K	Filter See Note 1
R91	560Ω	2	6R486036	BT-2-560	Filter See Note 2
R92	1 Meg.	½	6R6046	BTS-1 Meg.	Sync. Amp. Grid
R93	33KΩ	2	6R5768	BT-2-33K	Sync. Amp. Plate
R94	3.3Meg.20%	½	6R2118	BTS-3.3 Meg.	Sync. Sep. Grid
R95	680Ω	½	6R6428	BTS-680	Sync. Sep. Cathode
R96	22KΩ	½	6R6397	BTS-22K	Integrator
R97	8200Ω	½	6R2004	BTS-8200	"
R98	6800Ω	½	6R6428	BTS-6800	"
R99	470KΩ	½	6R6377	BTS-470K	Vert. Blocking Osc. Transformer Shunt
R100	1 Meg. 20%	½	6R6004	BTS-1 Meg.	Vert. Osc. Grid
R101	3.3Meg.20%	½	6R2118	BTS-3.3 Meg.	Voltage Divider
R102	560Ω	½	6R6291	BTS-560	Vert. Amp. Cathode
R103	3.3Meg.20%	½	6R2118	BTS-3.3 Meg.	Vert. Amp. Grid
R104	3300Ω	½	6R5581	BTS-3300	Vert. Peaking
R105	1.5 Meg.	½	6R3966	BTS-1.5 Meg.	Voltage Divider
R106	220KΩ	½	6R6407	BTS-220K	Filter
R107	1000Ω	1	6R6327	BW-1-1000	Filter
R108	56KΩ	½	6R6378	BTS-56K	Voltage Divider
R109	33KΩ	½	6A489166		Voltage Divider Temp. Comp.
R110	560KΩ	½	6R5697	BTS-560K	Horiz. AFC Grid
R111	180KΩ	½	6R6444	BTS-180K	Horiz. AFC Cathode
R112	100KΩ	½	6R6031	BTS-100K	Horiz. AFC Cathode
R113	8200Ω	½	6R2004	BTS-8200	Horiz. AFC Filter Network

RESISTORS (CONT.)

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA MOTOROLA PART No.	IRC PART No.	IDENTIFICATION CODES
R114	3.3 Meg.	½	6R2118	BTS-3.3 Meg.	Voltage Divider
R115	100KΩ	½	6R6031	BTS-100K	Horiz. Osc. Grid
R116	150KΩ	½	6R6398	BTS-150K	Horiz. AFC Filter Network
R117	120KΩ	1	6R5698	BTA-120K	Horiz. Osc. Plate
R118	1000Ω	½	6R6229	BTB-1000	" " "
R119	10KΩ	25	17K489099	EP-10K	Filter (Wire Wound)
R120	560KΩ	½	6R5697	BTS-560K	Feedback
R121	47Ω	½	6R2108		Parasitic Supp.
R122	1 Meg. 20%	½	6R6004	BTS-1 Meg.	Horiz. Output Grid
R123	82Ω	2	6R488222	BW-2-82	Horiz. Output Cathode
R124	560Ω	½	6R6291	BTS-560	Horiz. Output Cathode See Note 2
R125	15KΩ	2	6R5732	BT-2-15K	Horiz. Output Screen See Note 3
R126	3.3Ω	½	17K485412		HV Filament (Wire Wound)
R127	820KΩ	1	6R2053		HV Filter
R128	2200Ω	1	6R5687	BTA-2200	Horiz. Centering
R129	3900Ω	1	6R476012	BTA-3900	Voltage Divider See Note 1
R130	3900Ω	1	6R476012	BTA-3900	" " "
R131	3900Ω	1	6R476012	BTA-3900	" " "
R132	560Ω	1	6R488036	BTA-560	Focus Coil Shunt
R133	1000Ω	10	17K780343	AB-1000	Bias Network (Wire Wound)
R134	1800Ω	2	6R3964	BT-2-1800	Bias Network
R135	330Ω	1	6R6254	BTA-330	Voltage Divider
R136	2200Ω 20%	½		BTS-2200	" "
R137A	7000Ω	25	17A485413	AB-7000	Bleeder (Wire Wound)
B	1500Ω			AB-1500	Voltage Divider
C	1000Ω			AB-1000	Voltage Divider
R138	10Ω	2	6R488144	BW-2-10	Filter See Note 1
R139	270Ω	2	6R476116	BW-2-270	Filter
R140	270Ω	2	6R476116	BW-2-270	Filter
R141	22KΩ	½	6R6397	BTS-22K	AM Ant. Isolation

† Items C57A, C57B and R40 are combined into one unit obtainable under MFGR'S Part No. 21A473040
Note 1. Not used in all models.
Note 2. Some models use two resistors in parallel to obtain correct resistance and wattage.
Note 3. Some models use two resistors in series to obtain correct resistance and wattage.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	RATING SEC. 3	REPLACEMENT DATA MOTOROLA PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.
T1	117VAC	720VCT	5VAC	5VAC	25C484095	P-8157		TP-450
	@ 2.17A	.2AADC	@ 3A	@ 2A				
		450VCT						
		.049ADC						
		SEC. 4	SEC. 5	SEC. 6				
		5VAC	6.3VAC	6.3VAC				
		@ 2A	@ 8.1A	@ .6A				

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING DC RESISTANCE PRI.	RATING DC RESISTANCE SEC.	REPLACEMENT DATA MOTOROLA PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	NOTES
T2	140Ω		24B780356				Hor. Osc. Coil
	Tap @						
	40Ω						
T3	56Ω	160Ω	24B85416	A-8111 ‡	A-3000 ‡	TSO-1 ‡	Vert. Block Osc. Trans.
T4	430Ω	SEC. 1	25C90052	A-8117		TFB-1	Hor. Output Trans.
	Tap @	10.6Ω					
	185Ω	Tap @					
		.6Ω					
		SEC. 2					
		0Ω					
T5	520Ω	10.5Ω	25K489134	A-8115 ‡	A-3035 ‡	TSO-2	Vert. Output Trans.
T6A	14Ω		24K485474	DY-1			Hor. Deflection Yoke
B	64Ω						Vert. Deflection Yoke
T7	540Ω		24B485467				Focus Coil

‡ Drill new mounting holes.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING IMPEDANCE	RATING DC RES. PRI.	RATING DC RES. SEC.	REPLACEMENT DATA MOTOROLA PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	INSTALLATION NOTES
T8	5300Ω	3.2Ω	310Ω	.4Ω	25B489030	A-3877	A-2930	RO-9 ‡ ‡ Drill new mounting hole

SPEAKER

ITEM No.	RATINGS FIELD RES.	RATINGS V. C. IMP.	REPLACEMENT DATA MOTOROLA PART No.	JENSEN PART No.	QUAM PART No.	NOTES
SP1	100Ω	3.2Ω	60C489187		§	§ Supplied on order. Specify field resistance.
	CONE DIA.	V. C. DIA.				
SP2	9 3/8"	1"				

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA MOTOROLA PART No.	REPLACEMENT DATA MEISSNER PART No.	NOTES
L1	TV Ant. Transformer	0Ω	0Ω	1X780159		Complete with antenna receptacle, bracket and trimmer.
L2	Fil. Choke	0Ω		24A90064		
L3	1st Video IF	.1Ω		24B780394		
L4	FM Ant.	0Ω		24C484564		
L5	FM RF Plate Choke	.2Ω		24A484025		
L6	FM RF	0Ω		24K780024		
L7	FM Osc.	0Ω		24K489048		
L8	RF Choke	.1Ω		24A484025		
L9	Fil. Choke	.1Ω		24A74989		
L10	Fil. Choke	.1Ω		24A74989		
L11	1st FM IF	.1Ω	.1Ω	24B489056		
L12	AM Wave Trap	25Ω		24A489036		
L13	AM Ant.	.2Ω	4Ω	24B489042		
L14	AM Osc.	1Ω	7Ω	24B489044	14-1060 ‡	
L15	1st AM IF	16Ω	16Ω	24B481874		
L16	Fil. Choke	.1Ω		24A90064		
L17	RF Choke	1Ω		24A780127		
L18	2nd FM IF	.1Ω	.1Ω	24B780319		
L19	2nd AM IF	9Ω	9Ω	24B489033		
L20	2nd Video IF	.1Ω	.1Ω	24K780398		
L21	Fil. Choke	.1Ω		24A90064		
L22	RF Choke	1Ω		24A780127		
L23	3rd Video IF	.2Ω	.2Ω	24K489071		
L24	RF Choke	1Ω		24A780127		
L25	4th Video IF and Sound Take-Off	.1Ω	.1Ω	24B780406		Sound take-off winding 0Ω resistance.
L26	5th Video IF	.1Ω	.1Ω	24K780390		
L27	Peaking	2Ω		24K780386		Wound on 1 Meg. resistor.
L28	Sound Trap	1Ω		24K780402		
L29	Peaking	1.5Ω		24K780385		Wound on 1 Meg. resistor.
L30	Peaking	3Ω		24K780387		Wound on 1 Meg. resistor.
L31	Peaking	8Ω		24K780389		Wound on 12KΩ resistor.
L32	Peaking	6Ω		24K780388		Wound on 1 Meg. resistor.
L33	1st Sound IF	.1Ω		24K780152		
L34	2nd Sound IF	.2Ω		24B780349		Wound on 1 Meg. resistor.
L35	3rd Sound IF	.1Ω	.1Ω	24B780319		
L36	RF Choke	2Ω		24A780127		
L37	Ratio Det.	.2Ω	.1Ω	24B484084		
L38	RF Choke	1Ω		24A780127		
L39	Horiz. Linearity Control	36Ω		24B470796		
L40	Horiz. Size Control	.3Ω		24B90119		

‡ Add 50MMF capacitor from high side of tuning cap to oscillator grid.

DIAL LIGHTS

ITEM No.	BASE TYPE	VOLTS	AMPS.	BEAD COLOR	REPLACEMENT DATA MOTOROLA PART No.		NOTES
M1	Bayonet	7.5	0.2	White	65X4151		Type #51
M2	Bayonet	7.5	0.2	White	65X4151		Type #51
M3	Bayonet	7.5	0.2	White	65X4151		Type #51

MISCELLANEOUS

ITEM No.	PART NAME	MOTOROLA PART No.	NOTES
M4	TV Tuner Assembly	TT-4	
M5	FM & BC Tuner Assy.	PT-21	
M6	Fuse	65K474899	Type AGC, 250V @ 1/8 Amp.
M7	Change Over Switch	40C484046	
M8	Ion Trap	24A489077 or 24A780604	
M9	Cable Assembly	1X484841	Speaker, Includes Receptacle
M10	AM Tuning Cap.	19B481816	Variable, Two Gang. (16-392MMF) (15-143MMF)
M11	Rectifier	48A90173	IN34 Germanium Crystal
	Socket	9B90116	Picture Tube (12 Pin) and Leads
	Back & Line Cord Assembly	1X780032	
	Cabinet	16F484120	Brown Mahogany, used with model No. VF103.
	Cabinet	16K484121	Red Mahogany, used with model No. VF103M.
	Escutcheon	13C489135	Dial Scale
	Knob	36B489176	Channel Selector, used on model No. VF103M.
	Knob	36A485480	Fine Tuning Control, used on model No. VF103M.
	Knob	36K780033	Change Over Switch, used on model No. VF103M.
	Knob	36B485489	Contrast and Volume Control, used on model No. VF103M
	Knob	36B489179	Vert. Hold Control, used on model No. VF103M.
	Knob	36A485477	Brightness, Horiz. Hold and Off-Tone, used on model No. VF103M.
	Knob	36B489182	AM-FM Tuning Control, used on model No. VF103M.
	Knob	36K489177	Channel Selector, used on model VF103.
	Knob	36K485481	Fine Tuning Control, used on model VF103
	Knob	36K780034	Change-Over Switch, used on model VF103.
	Knob	36K485490	Contrast and Volume Control, used on model VF103.
	Knob	36K489180	Vert. Hold Control, used on model VF103.
	Knob	36K485478	Brightness, Horiz. Hold and Off-Tone,used on model VF103.
	Knob	36K489183	AM-FM Tuning Control, used on model VF103.

HORIZONTAL OSCILLATOR ADJUSTMENTS

HORIZONTAL OSCILLATOR CHECK.

(A) Tune in a picture and sync it vertically with the vertical hold control.

(B) Set the contrast control to approximately normal position.

(C) Turn the horizontal hold control throughout its range. The picture should remain in sync for all of the range except at the extreme counterclockwise position, where the picture will tend to slip to the right.

(D) If picture fails to show this tendancy to slip turn B2 until it does show tendancy to slip with the horizontal hold control in extreme counterclockwise position.

(E) Rotate the horizontal hold control clockwise to a point approximately 15 degrees past where the picture syncs properly.

COMPLETE HORIZONTAL OSCILLATOR ALIGNMENT.

If the receiver failed the above check, and the proper lock-in range cannot be obtained as given, complete oscillator alignment as follows will be required.

(A) Turn the contrast control to normal position.

(B) Turn B2 fully closed, (clockwise).

(C) Turn B3 two turns counterclockwise from tight.

(D) Adjust B1 so that picture will lock-in over the whole range of the horizontal hold control. If this condition cannot be had, back off B3 until picture will hold sync over entire range of horizontal hold control.

(E) Turn the horizontal hold to the extreme counterclockwise position.

(F) Adjust B2 counterclockwise until picture shows a tendancy to slip to the right.

(G) Rotate horizontal hold control clockwise to a point approximately 15 degrees past where picture syncs normally. It should now be possible to change stations, or turn set off and on without picture losing synchronism.

HORIZONTAL WIDTH AND LINEARITY ADJUSTMENTS.

(A) Turn B5 fully clockwise.

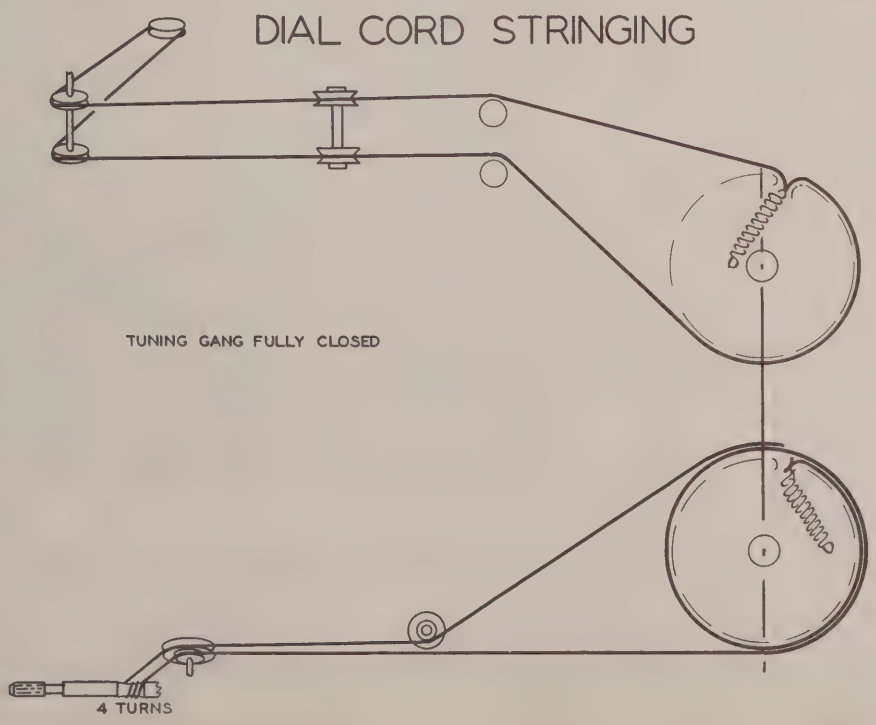
(B) Adjust B4 for best compromise between brightness and horizontal linearity.

(C) Adjust B5 until picture fills the mask horizontally.

(D) Adjust B6 for best linearity of right side of picture. Adjustments B5 and B6 are interacting and adjustment of one will probably necessitate adjustment of the other.

(E) Center the picture horizontally with the adjustment screws on the focus coil.

DIAL CORD STRINGING



VOLTAGE AND RESISTANCE MEASUREMENTS

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6AG5	-4.8VDC	0V	6.3VAC	0V	240VDC	235VDC	0V		
V2	6J6	80VDC	75VDC	0V	6.3VAC	-.7VDC	§-.3VDC	0V		
‡ V3	6AU6	0V	0V	0V	6.3VAC	105VDC	105VDC	.6VDC		
‡ V4	6EA7	100VDC	§-1.8VDC	0V	6.3VAC	0V	0V	0V	0V	100VDC
* V5	6BE6	§-8.2VDC	1.2VDC	0V	6.3VAC	115VDC	95VDC	0V		
V6A	6BA6	-25VDC	0V	6.3VAC	0V	150VDC	150VDC	.1VDC		
* V6B	6BA6	0V	0V	6.3VAC	0V	95VDC	125VDC	1VDC		
‡ V6C	6BA6	-.8VDC	0V	6.3VAC	0V	80VDC	110VDC	.5VDC		
V7A	6BA6	-.25VDC	0V	6.3VAC	0V	150VDC	150VDC	.1VDC		
* V7B	6BA6	-.7VDC	0V	6.3VAC	0V	-.3VDC	-.3VDC	0V		
‡ V7C	6BA6	-.3VDC	0V	6.3VAC	0V	105VDC	105VDC	1VDC		
V8	6BA6	0V	0V	6.3VAC	0V	150VDC	150VDC	1.5VDC		
V9	6AG5	0V	1.4VDC	6.3VAC	0V	95VDC	115VDC	1.4VDC		
V10	6T8	0V	-.2VDC	0V	6.3VAC	0V	-1VDC	0V	-.3VDC	135VDC
V11	6AC7	0V	0V	0V	-.2VDC	.5VDC	145VDC	6.3VAC	250VDC	
V12	6BA6	-.2VDC	0V	6.3VAC	0V	35VDC	35VDC	.6VDC		
V13	6AU6	0V	0V	6.3VAC	0V	150VDC	150VDC	1.4VDC		
V14	6AK6	0V	0V	6.3VAC	0V	165VDC	165VDC	6.6VDC		
V15	6T8	-.5VDC	-.9VDC	-.5VDC	0V	6.3VAC	-18VDC	0V	-.7VDC	55VDC
V16	6V6GT	0V	6.3VAC	240VDC	250VDC	0V	280VDC	0V	13VDC	
V17	6SN7GT	#-.4VDC	65VDC	#0V	-1VDC	185VDC	6.2VDC	0V	6.3VAC	
V18	6SN7GT	#0V	# 330VDC	#10VDC #20VDC	# -24VDC	#70VDC #135VDC	#0V	0V	6.3VAC	
V19	6SN7GT	# -.9VDC	#140VDC	#18VDC	#-45VDC	# 150VDC	#0V	0V	6.3VAC	
V20	6BG6G	#0V	#65VDC	#10VDC	#330VDC	#0V	#2.8VDC	6.3VAC	265VDC	TOP CAP †
V21	5V4G	310VDC	340VDC	-65VDC	270VDC	0V	270VDC	-65VDC	340VDC	
V22	1B3GT	† DO NOT MEASURE								
V23	5U4G	0V	290VDC	290VDC	360VAC	250VDC	360VAC	-65VDC	390VDC	
V24	5Y3GT	0V	170VDC	0V	235VAC	0V	235VAC	0V	170VDC	
V25	10BP4	0V	-55VDC	PIN 10 230VDC	PIN 11 0V	PIN 12 6.3VAC				

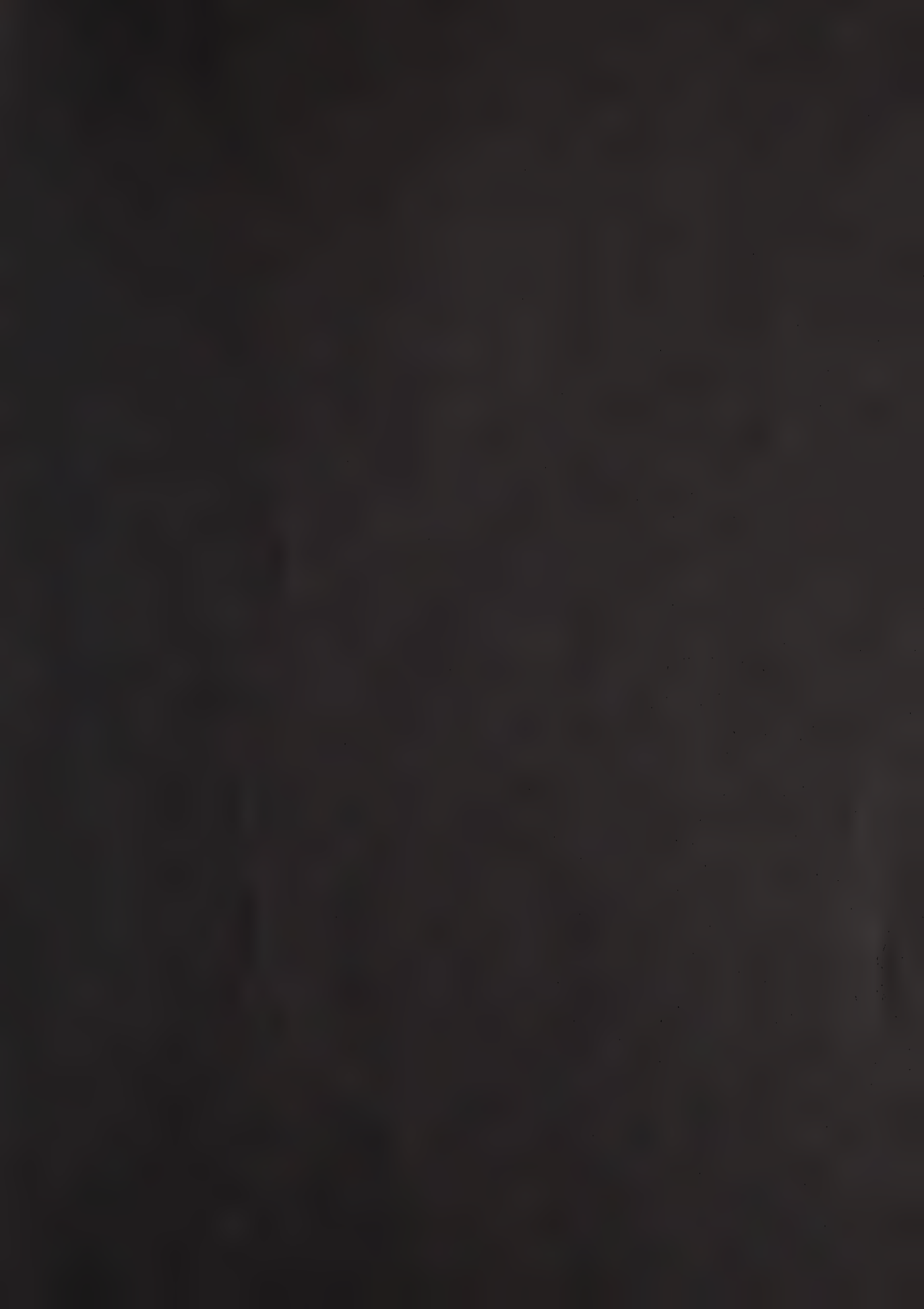
RESISTANCE READINGS

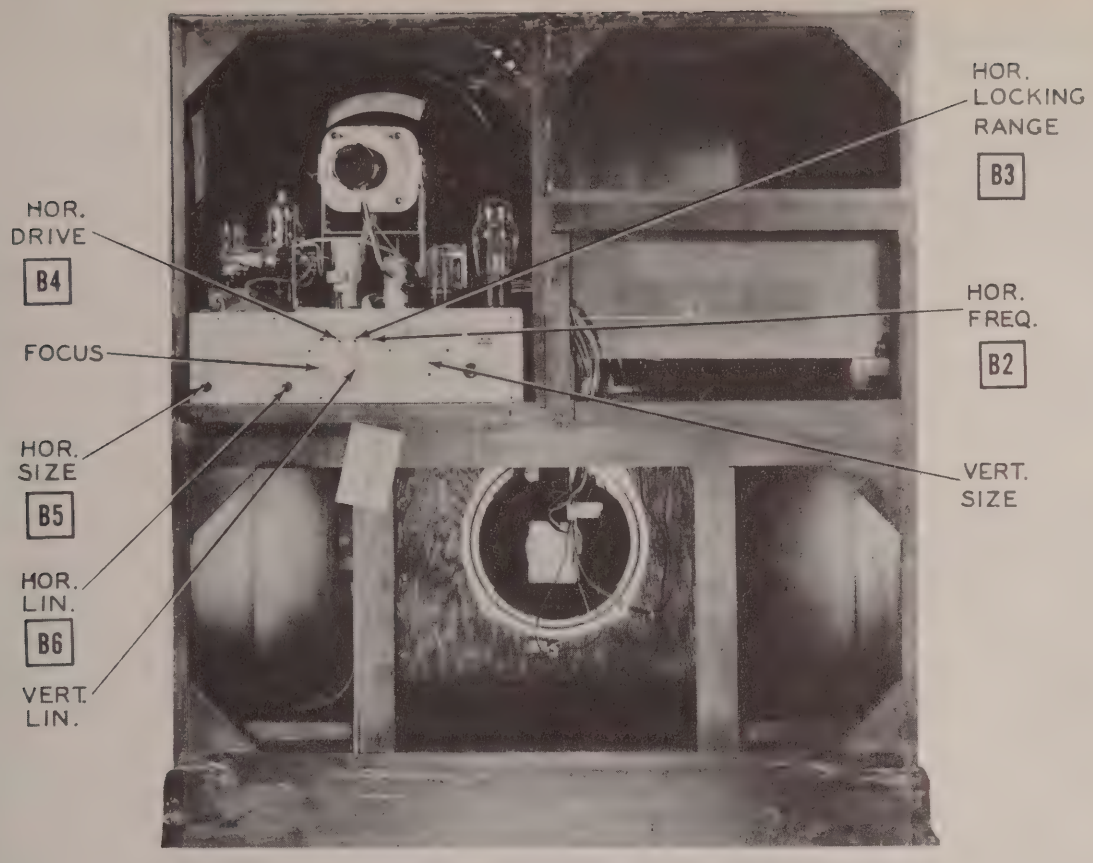
Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6AG5	600KΩ	0Ω	.2Ω	0Ω	♦18KΩ	♦82KΩ	0Ω		
V2	6J6	♦10KΩ	♦15KΩ	0Ω	.2Ω	900KΩ	15KΩ	0Ω		
‡ V3	6AU6	0Ω	0Ω	0Ω	.2Ω	†600Ω	†3900Ω	100Ω		
‡ V4	6BA7	†1500Ω	22KΩ	.2Ω	.2Ω	.1Ω	0Ω	0Ω	0Ω	†2000Ω
* V5	6BE6	22KΩ	120Ω	0Ω	.2Ω	†4KΩ	†4500Ω	3 Meg.		
V6A	6BA6	8KΩ	0Ω	.2Ω	0Ω	†600Ω	†600Ω	68Ω		
* V6B	6BA6	3 Meg.	0Ω	.2Ω	0Ω	†3KΩ	†600Ω	68Ω		
‡ V6C	6BA6	3 Meg.	0Ω	.2Ω	0Ω	†3KΩ	†600Ω	68Ω		
V7A	6BA6	3KΩ	0Ω	.2Ω	0Ω	†600Ω	†600Ω	68Ω		
* V7B	6BA6	500KΩ	0Ω	.2Ω	0Ω	† Inf.	† Inf.	68Ω		
‡ V7C	6BA6	4 Meg.	0Ω	.2Ω	0Ω	†600Ω	†600Ω	68Ω		
V8	6BA6	.1Ω	0Ω	.2Ω	0Ω	†600Ω	†600Ω	68Ω		
V9	6AG5	.1Ω	220Ω	.2Ω	0Ω	†10KΩ	†6KΩ	220Ω		
V10	6T8	0Ω	1800Ω	.1Ω	.2Ω	0Ω	3.3 Meg.	0Ω	470KΩ	♦120KΩ
V11	6AC7	0Ω	0Ω	0Ω	600KΩ	40Ω	♦47KΩ	.2Ω	♦3KΩ	
V12	6BA6	100KΩ	0Ω	.2Ω	0Ω	†47KΩ	†47KΩ	220Ω		
V13	6AU6	30KΩ	0Ω	.2Ω	0Ω	†600Ω	†600Ω	100Ω		
V14	6AK6	.1Ω	0Ω	.2Ω	0Ω	♦6KΩ	♦6KΩ	470Ω		
V15	6T8	Inf.	20KΩ	Inf.	0Ω	.2Ω	42KΩ	0Ω	10 Meg.	♦1 Meg.
V16	6V6GT	0Ω	.2Ω	♦850Ω	♦550Ω	470KΩ	8KΩ	0Ω	270Ω	
V17	6SN7GT	#1 Meg.	♦34KΩ	#0Ω	3.3 Meg.	♦2KΩ	7KΩ	0Ω	.2Ω	
V18	6SN7GT	#3.3Meg.	♦1800Ω	#5.6KΩ 580Ω	#1 Meg.	♦3.5Meg. 1.8 Meg.	#0Ω	0Ω	.2Ω	
V19	6SN7GT	#750KΩ	♦30KΩ	#270KΩ	#200KΩ	▲120KΩ	#0Ω	0Ω	.2Ω	
V20	6BG6G	#1 Meg.	0Ω	#95Ω	#8KΩ	#1 Meg.	#15Ω	.2Ω	▲13KΩ	TOP CAP ▲200Ω
V21	5V4G	▲10KΩ	▲0Ω	#0Ω	♦100Ω	Inf.	♦100Ω	#0Ω	▲0Ω	
V22	1B3GT	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	TOP CAP ▲800Ω
V23	5U4G	Inf.	10KΩ	10KΩ	350Ω	10KΩ	350Ω	320Ω	10KΩ	
V24	5Y3GT	Inf.	70KΩ	Inf.	340Ω	Inf.	340Ω	Inf.	70KΩ	
V25	10BP4	0Ω	700KΩ	PIN 10 ♦800Ω	PIN 11 0Ω	PIN 12 .2Ω				

§ Taken with vacuum tube voltmeter.
* Readings taken in BC position.
‡ Readings taken in FM position.
# Measured from pin 6 of V19
† Do not measure.

♦ Measured from pin 2 of V23.
† Measured from pin 2 of V24.
▲ Measured from pin 8 of V21.
Measured from pin 6 of V19.
* Readings taken in broadcast position.
‡ Readings taken in FM position.

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltage measured at 1,000 ohms.
2. Pin numbers are counted in a clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings.
5. Front panels controls set at minimum.
6. Where readings may vary according to the setting of the service controls, both minimum and maximum readings are given.





CABINET-REAR VIEW

DISASSEMBLY INSTRUCTIONS

1. Loosen 2 set screws holding channel selector switch knob and remove knob. Remove 5 push-on type knobs from other controls.
2. Remove TV chassis power cord plug from socket.
3. Remove 10 1/4" hex head screws holding rear cover over TV compartment. Remove cover.
4. For access to rear of phono compartment: Remove 12 1/4" hex head slotted screws holding rear cover. Remove cover.
5. Remove phono motor power plug from top right side of TV chassis.
6. Remove panel lamp from bracket inside bottom center of cabinet.
7. Disconnect speaker plug at speaker.
8. Disconnect phono audio plug.
9. Remove 2 1/4" hex head slotted screws holding antenna terminal strip to cabinet.
10. Free wires from clamp and feed thru hole to TV chassis compartment.
11. Remove 6 1/4" hex head slotted screws holding TV chassis to cabinet.
12. Remove chassis by sliding to rear.
13. Remove 4 5/16" hex nuts holding speaker to cabinet.
14. Remove speaker.

PHILCO MODELS
50-520, 50-5201

PHILCO MODELS
50-520, 50-5201

PHILCO MODEL 50-520

TRADE NAME	Philco, Models 50-520, 50-520I
MANUFACTURER	Philco Corp., Tioga & "C" Sts., Philadelphia, Pa.
TYPE SET	AC-DC Operated Superheterodyne Receiver with Loop Antenna.
TUBES (FIVE)	Types 7A8 Converter, 12BA6 IF Amp., 14B6 DET-AVC-AF, 50L6GT Power Output, 35Z5GT Power Output.
POWER SUPPLY	105-125 Volts AC-DC RATING .26 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	540-1620KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

To set dial pointer turn tuning gang fully closed and set pointer to the last calibration mark on left end of dial backplate.

Use isolation transformer if available. If not connect a .1 MFD. cap. in series with low side of signal generator and B-.

Loop should be maintained in same relative position to chassis as when receiver is in cabinet.

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to stator of rear section of tuning gang. Low side to B-.	455KC (400~ Mod.)	Tuning gang fully closed.	Across voice coil.	A1, A2 A3, A4	Adjust for maximum output. If isolation transformer is not used reduce dummy antenna to .001 MFD to reduce hum modulation.
2.		Loop	1600KC	Tuning gang fully open.	"	A5	Adjust for maximum output.
3.		Loop	1500KC	Tune for max. output.	"	A6	Adjust for maximum output.

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DATE 10/49 SET #73 FOLDER #9

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: PHILCO PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	Converter	7A8	7A8	8U	
V2	IF Amp.	12BA6	12BA6	7BK	
V3	DET-AVC-AF	14B6	14B6	8W	
V4	Power Output	50L6GT	50L6GT	7AC	
V5	Rectifier	35Z5GT	35Z5GT	6AD	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: PHILCO PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	30	150	30-2573	PRSA150/30-20	EZ42215		TA-303	Filter-Orange
B	25	150		PRS150/24				Filter-Blue
C	20	150						Filter-Red
C2	47	500	60-00515307	1468-00005	5W5Q5	GP1K-47	1FM-45	Osc. Grid Cap
C3	10		30-1224-26	1469-00001	5R5Q1	NPOK-10	MS-41	Fixed Trimmer
C4	.05	200	61-0122	P288-05	GT2S5		TM-15	AVC Filter
C5	.003	600	61-0109	P688-003	GT6D3	GP2M-003	TM-23	Decoupling
C6	.01	400	61-0120	P488-01	GT4S1	GP2-335-01	TM-11	Audio Coupling
C7	.01	400	61-0120	P488-01	GT4S1	GP2-335-01	TM-11	Audio Coupling
C8	220		62-122001001	1468-00025	5W5T25	GP1K-220	1FM-325	Output Grid Bypass
C9	.02	400	61-0108	P488-02	GT4S2		TM-12	Output Plate Bypass
C10	.1	400	61-0113	P488-1	GT4P1		72P52	Line Isolation
C11	.04	400	45-3500-2	P488-04	GT6S4		TM-15	Line Filter

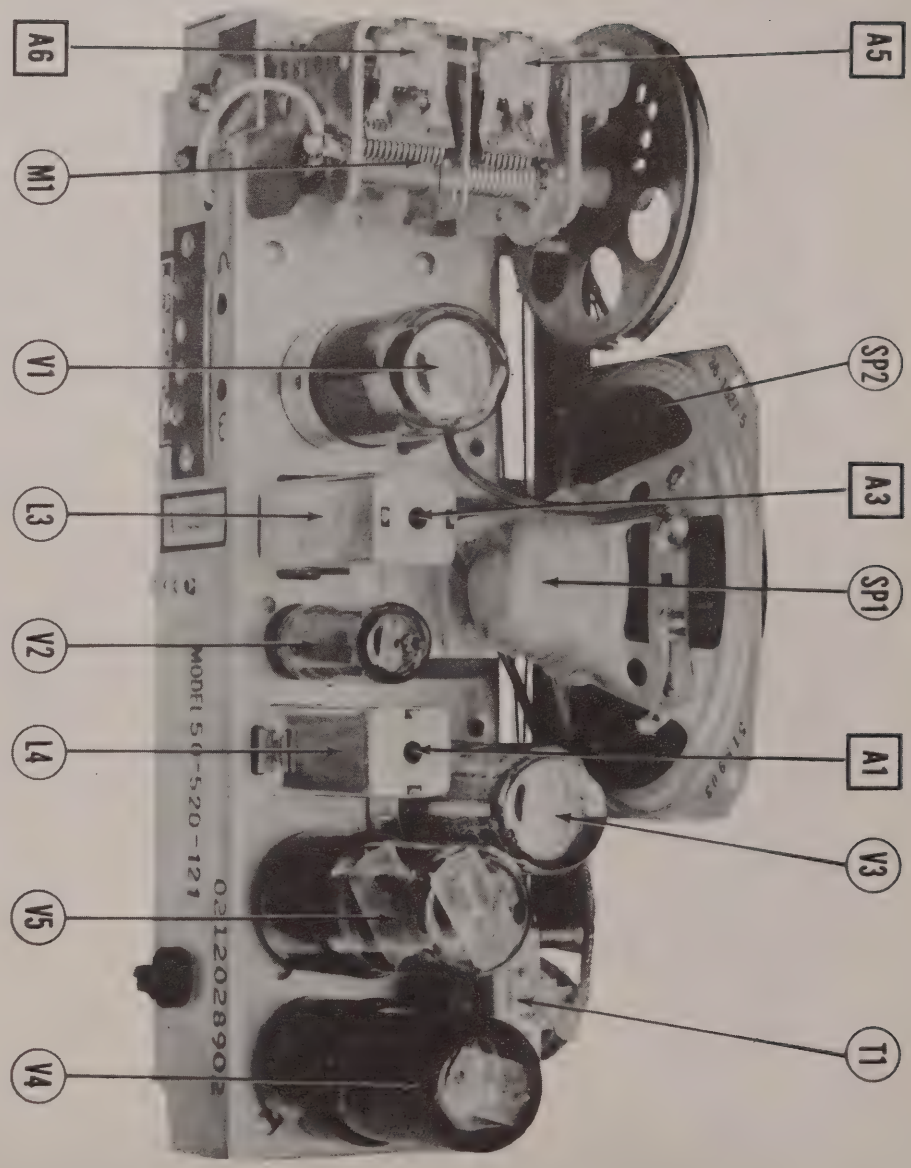
CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: PHILCO PART No.	IRC PART No.	CLAROSTAT PART No.	INSTALLATION NOTES
R1A	500KΩ	½	33-5566-4	Q13-133	M-60-Z	Volume control
B	Switch		Not Req.	76-1	SW-A	Attach to R1A per instructions

RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: PHILCO PART No.	IRC PART No.	IDENTIFICATION CODES	
R2	100KΩ	½	66-4108340	BTS-100K	Osc. Grid	
R3	1.2 Meg	½		BTS-1.2 Meg	IF Grid	
R4	39KΩ	½	66-3398340	BTS-39K	Screen Dropping	
R5	47KΩ	½	66-3478340	BTS-47K	Diode Filter	
R6	2.2 Meg.	½	66-5228340	BTS-2.2 Meg.	AVC Network	
R7	3.3 Meg.	½	66-5338340	BTS-3.3 Meg.	AF Grid	
R8	470KΩ	½	66-4478340	BTS-470K	AF Plate	
R9	470KΩ	½	66-4478340	BTS-470K	Output Grid	
R10	130Ω	½	66-1134340	BW-½-120	Output Cathode	Wire Wound
R11	1200Ω	½	66-2128340	BTS-1200	Filter	
R12	220Ω	1	66-1224340	BW-1-220	Filter	
R13	150KΩ	½	66-4158340	BTS-150K	Isolation	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA				INSTALLATION NOTES
	IMPEDANCE		DC RES.		PHILCO PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
	PRI.	SEC.	PRI.	SEC.					
T1	2500Ω	3.5Ω	200Ω	.6Ω	32-8384	A-3332	A-3025	RO-1A	

SPEAKER

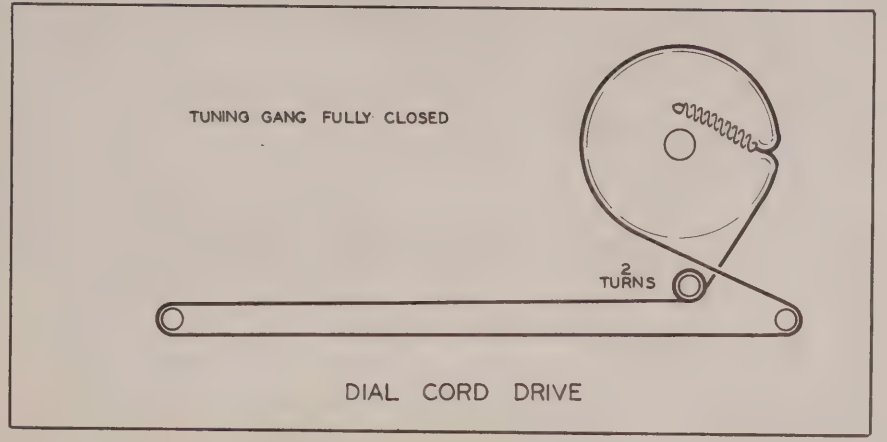
ITEM No.	RATINGS		REPLACEMENT DATA			INSTALLATION NOTES
			PHILCO PART No.	JENSEN PART No.	QUAM PART No.	
	FIELD	V.C. IMP.		ST-113		
SP1	PM	3.5Ω	36-1627-5	MOD.P4-X	4A07	
	CONE DIA.	V.C. DIA.				
SP2	3 7/8"	9/16"				

R F COILS

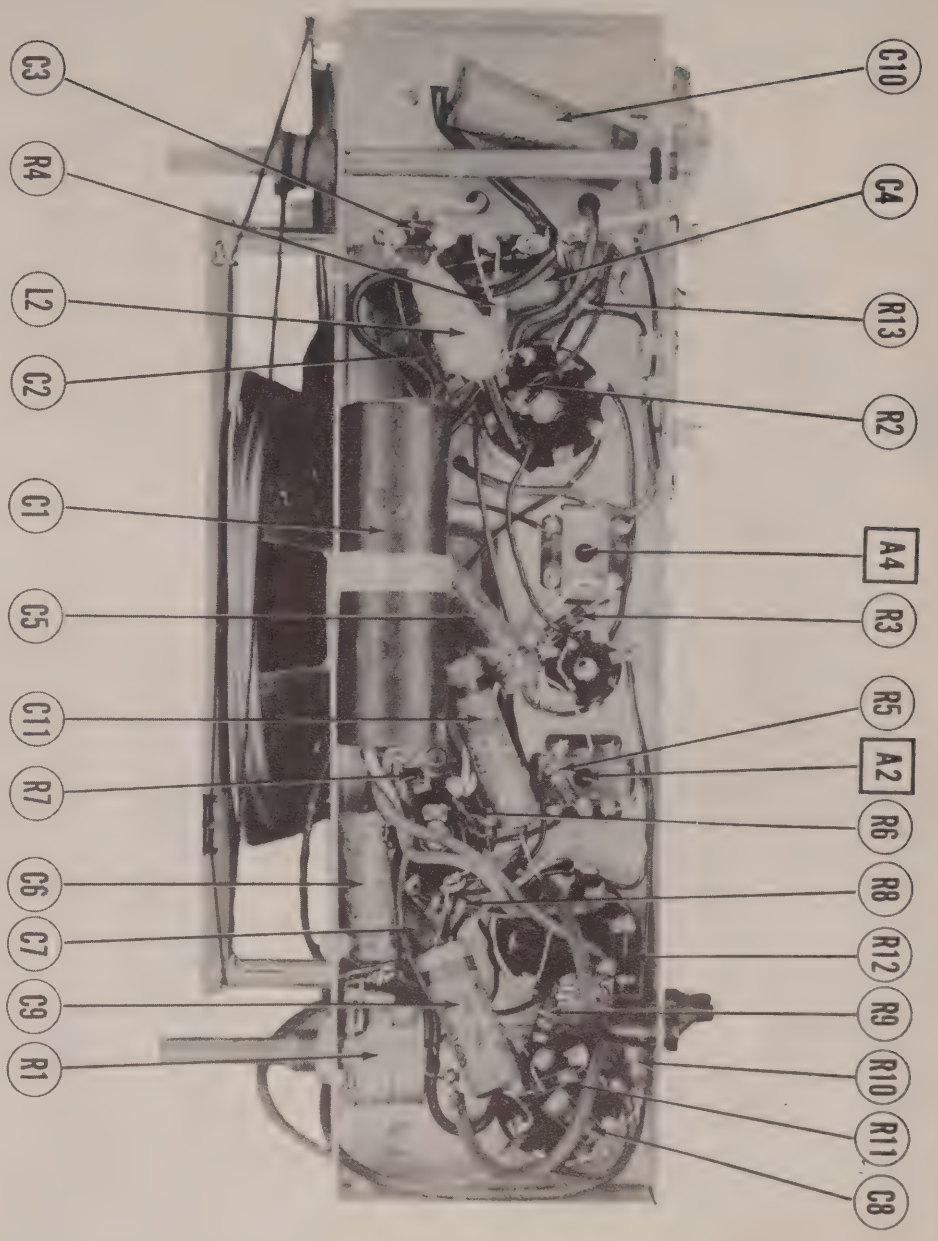
ITEM No.	USE	DC RES.		REPLACEMENT DATA	
		PRI.	SEC.	PHILCO PART No.	MEISSNER PART No.
L1	Loop Ant.	.2Ω	3.5Ω	32-4052-33	
L2	Osc. Coil	3Ω	8Ω	34-4263	
L3	Input IF	23Ω	23Ω	32-4160-8A	16-6678
L4	Output IF	16Ω	16Ω	32-4240-A	16-6678

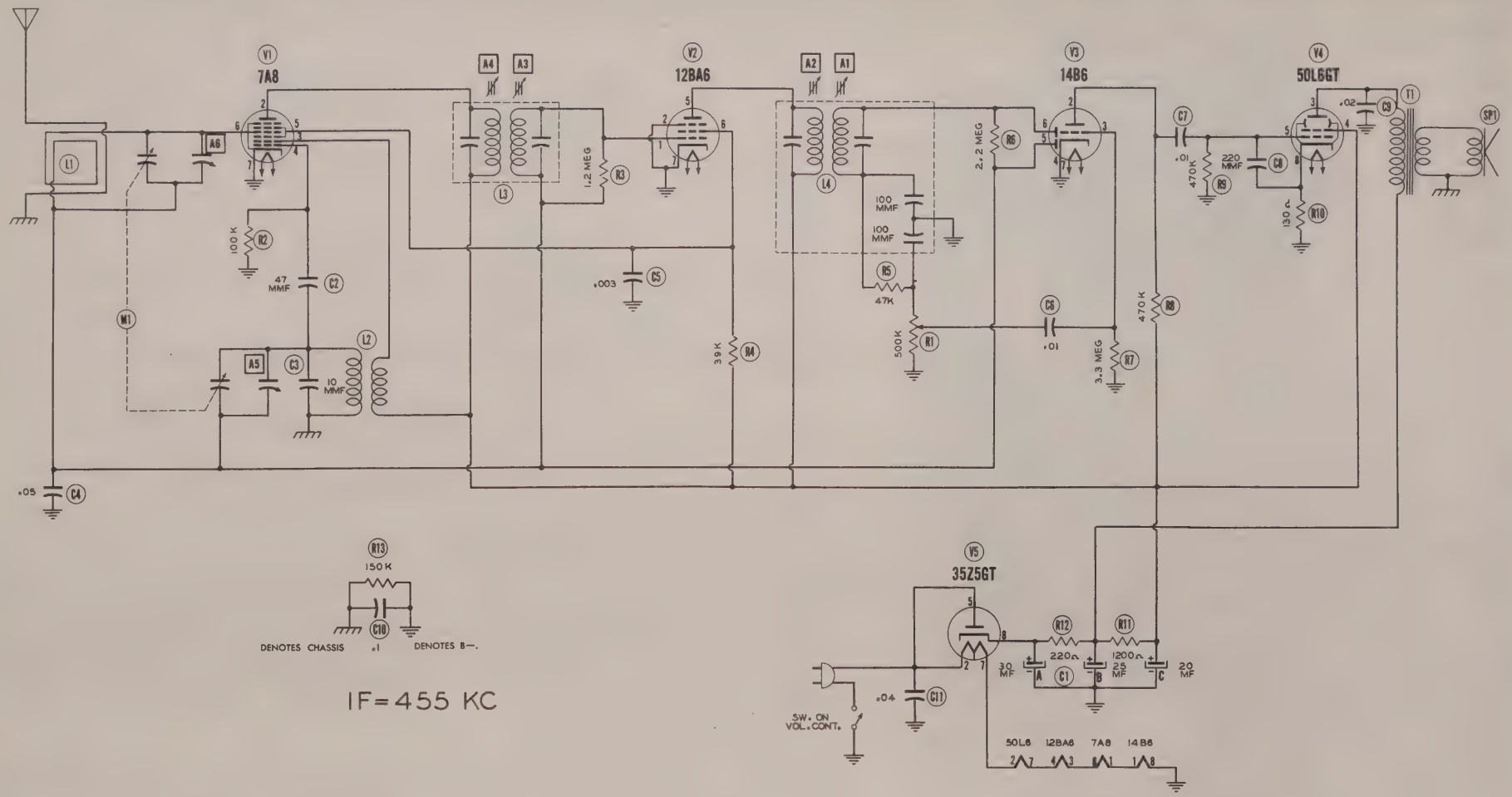
MISCELLANEOUS

ITEM No.	PART NAME	PHILCO PART No.	NOTES
M1	2 Gang Var.Cap.	31-2727-2	(27-496MMF, 24-165MMF)
	Cabinet	10750	Model 50-520
	Cabinet	10750-1	Model 50-520I
	Dial Pointer	56-4362-2	
	Knob	54-4527-11	



CHASSIS—BOTTOM VIEW





IF=455 KC

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	7A8	12VAC	110VDC	43VDC	§-4.3 VDC	110VDC	-1VDC	0V	24VAC
V 2	12BA6	-1VDC	0V	24VAC	36VAC	110VDC	43VDC	0V	
V 3	14B6	12VAC	50VDC	-1.2VDC	0V	-1VDC	-1.1VDC	0V	0V
V 4	50L6GT	0V	83VAC	112VDC	110VDC	0V	122VDC	36VAC	7.0VDC
V 5	35Z5GT	0V	117VAC	110VAC	110VDC	117VAC	122VDC	83VAC	135VDC

§ Taken With Vacuum Tube Voltmeter.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	7A8	12Ω	†1500Ω	†1500Ω	100KΩ	†40KΩ	3 Meg.	0Ω	24Ω
V 2	12BA6	3 Meg.	0Ω	24Ω	36Ω	†1500Ω	†40KΩ	0Ω	
V 3	14B6	12Ω	†470KΩ	3.5 Meg	0Ω	3.5 Meg	500KΩ	0Ω	0Ω
V 4	50L6GT	Inf.	90Ω	†440Ω	†1500Ω	470KΩ	†220Ω	36Ω	130Ω
V 5	35Z5GT	0Ω	120Ω	112Ω	†1500Ω	120Ω	†220Ω	90Ω	50KΩ

† Measured From Pin 8 Of V5.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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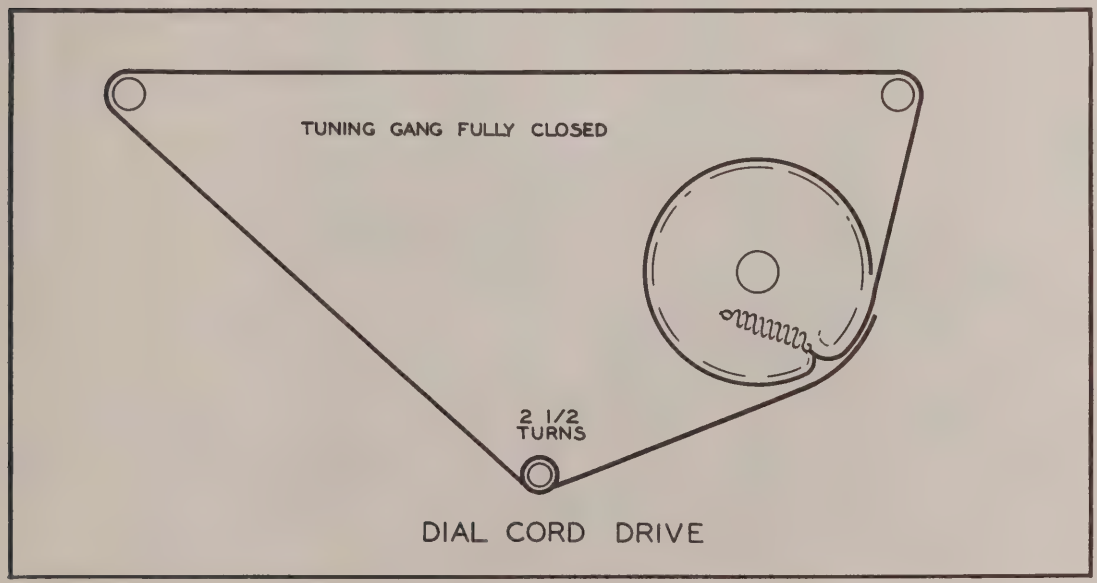
1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

RCA VICTOR MODELS 9W101, 9W103, (Ch. RC-618B) 9W105 (Ch. RC-618C)

RCA VICTOR MODELS 9W101, 9W103, (Ch. RC-618B) 9W105 (Ch. RC-618C)

RCA VICTOR MODEL 9W101

TRADE NAME	RCA Victor, Models 9W101, 9W103 (Ch. RC-618B), 9W105 (Ch. RC-618C)		
MANUFACTURER	RCA Victor Div., Radio Corp. of America, Camden, New Jersey		
TYPE SET	AC Operated Combination Phono-Radio, AM-FM Superheterodyne Receiver with Loop Antenna		
TUBES(TEN)	Types 6J6 Converter, 6BA6 1st IF Amp., 6AU6 FM 2nd IF Amp., 6AL5 Ratio Det., 6AV6 DET-AVC-Phase Inv., 6BF6 Phono Pre-Amp., 6AV6 AF Amp., (2) 6V6GT Power Output, 6X5GT Rectifier		
POWER SUPPLY	110-120 Volts AC	RATING:	.57 Amp. @ 117 Volts AC
TUNING RANGE-BROADCAST	540-1600KC	FREQ. MOD.	88-108MC



DIAL CORD DRIVE

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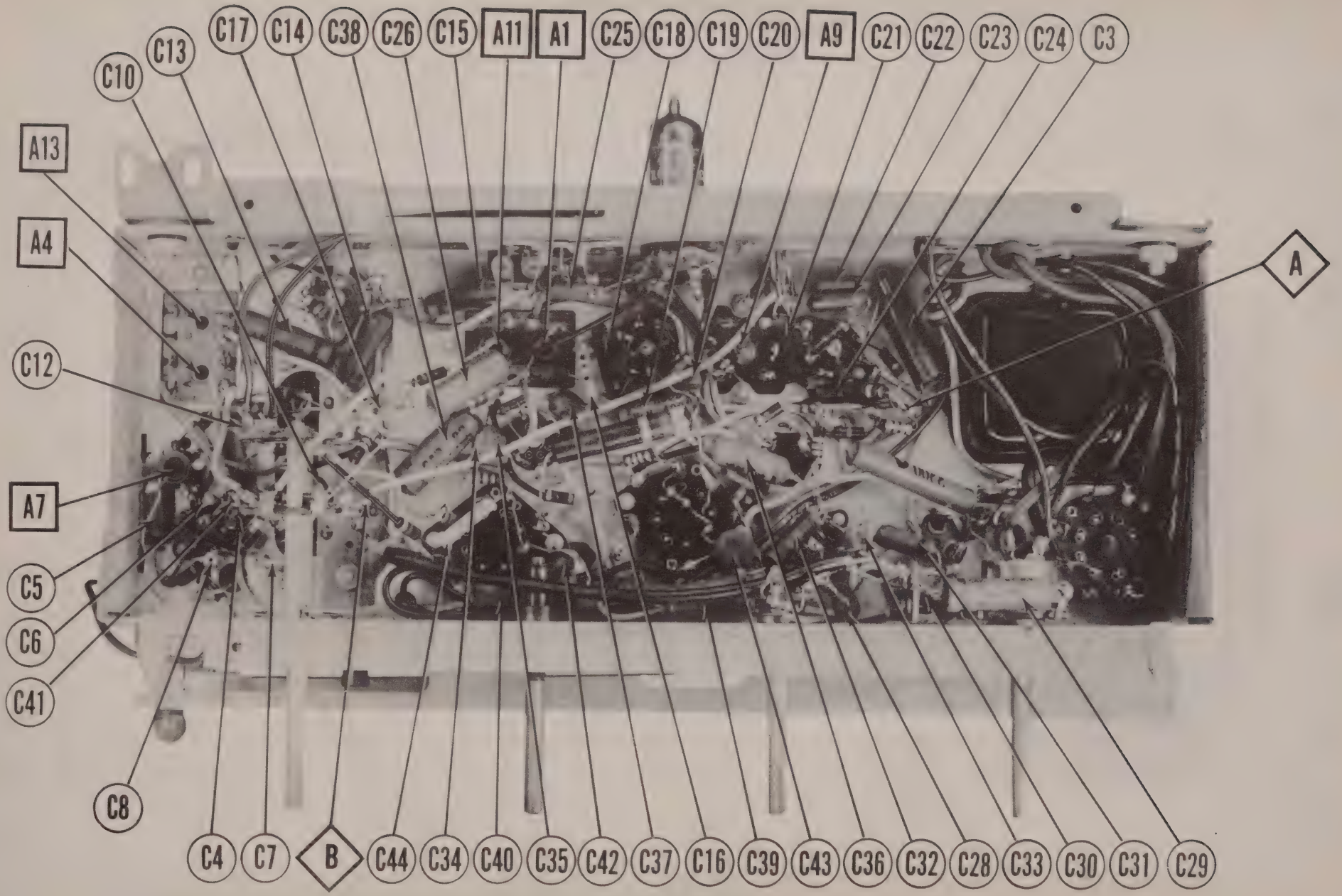
DATE 10/49 SET #73 FOLDER #10


C10
C13
C17
C14
C38
C26
C15
A11
A1
C25
C18
C19
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C23
C24
C3
A13
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C12
A7
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C8
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C34
C40
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C16
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C43
C36
C32
C28
C33
C30
C31
C29

R23
R24
R25
R1
R44
R27
R38
R37
R35
M6
R26
R16
R40
R39
R42
L8
R29
R41
R14
R43
R10
R36
R2
R8
R4
M5
L4
R7
R5
R3
R11
R9
R6
R12
R13
R28
R32
R17
R31
R15
R33
R34
R18
R20
R19
R21
R22

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: RCA PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	Converter	6J6	6J6	7BF	
V2	1st IF Amp.	6BA6	6BA6	7BK	
V3	FM 2nd IF Amp.	6AU6	6AU6	7BK	
V4	Ratio Det.	6AL5	6AL5	6BT	
V5	DET-AVC-Phase Inverter	6AV6	6AV6	7BT	
V6	Phono Pre-Amp.	6BF6	6BF6	7BT	
V7	AF Amp.	6AV6	6AV6	7BT	
V8	Power Output	6V6GT	6V6GT	7AC	
V9	Power Output	6V6GT	6V6GT	7AC	
V10	Rectifier	6X5GT	6X5GT	6S	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: RCA PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	30	350	73372	AF64H4A	UP		EL-323	■ Filter
B	30	300			2235C			▲ Filter
C	20	25						Output Cathode Bypass
C2A	10	300	74200	AF3G	UP1535		EL-203	Decoupling
B	100	10		PRS25/100	BRH121		UHC-112	Audio Cathode Bypass
C3	2	50	73747	PRS150/4	BBR2-50		TVA-12	Stabilizing Cap.
C4	1500		73748	1467-0015	1W5D15	GP2L-0015	29C3	RF Coupling
C5	.01	400	71925	P488-01	GT4S1		TM-11	Osc. Plate Decoupling
C6	2		73866					Osc. Feedback
C7	68		33103		5W5Q7	GP1K-68	MS-47	Osc. Coupling
C8	15		31353			GP1K-15	MS-415	Osc. Grid Cap
C9	56		73867			GP1K-56		Osc. Coupling
C10	150		48125	1468-00015	5W5T15	GP2K-150	1FM-315	Osc. Grid Cap
C11	5		93056	1469-000005	5R5V5	NP0K-5	MS-55	Fixed Trimmer
C12	.005	400	71553	P688-005	GT6D5	GP2M-005	TM-25	Mixer Decoupling
C13	.05	200	71551	P288-05	GT2S5		TM-15	AVC Filter
C14	.005	400	71553	P688-005	GT6D5	GP2M-005	TM-25	1st IF Screen Bypass
C15	.005	400	71553	P688-005	GT6D5	GP2M-005	TM-25	1st IF Decoupling
C16	150		48125	1468-00015	5W5T15	GP2K-150	1FM-315	RF Filter
C17	150		48125	1468-00015	5W5T15	GP2K-150	1FM-315	RF Filter
C18	.005	200	71926	P688-005	GT6D5	GP2M-005	TM-25	2nd IF Cathode Bypass
C19	.005	400	71553	P688-005	GT6D5	GP2M-005	TM-25	2nd IF Screen Bypass
C20	.005	400	71553	P688-005	GT6D5	GP2M-005	TM-25	2nd IF Decoupling
C21	.005	200	71926	P688-005	GT6D5	GP2M-005	TM-25	De-emphasis
C22	330	500	39640	1468-0003	5W5T3	GP2K-330	1FM-335	Diode Load Cap
C23	330	500	39640	1468-0003	5W5T3	GP2K-330	1FM-335	Diode Load Cap
C24	.005	200	71926	P688-005	GT6D5	GP2M-005	TM-25	RF Bypass
C25	.01	400	73561	P488-01	GT4S1	GP2-335-01	TM-11	Phono Tone Compensation
C26	.01	400	73561	P488-01	GT4S1	GP2-335-01	TM-11	Audio Coupling
C27	.002	200	73750	P688-002	GT6D2	GP2M-002	TM-22	Tone Compensation Note
C28	.02	200	71928	P488-02	GT2S2		TM-12	Tone Compensation
C29	.015	400	72120	P488-015	GT6S15			Tone Compensation
C30	.003	200	73659	P688-003	GT6D3	GP2M-003	TM-23	Audio Coupling
C31	.01	200	71923	P488-01	GT2S1	GP2-335-01	TM-11	Audio Coupling
C32	.003	400	72573	P688-003	GT6D3	GP2M-003	TM-23	Tone Compensation
C33	150		48125	1468-00015	5W5T15	GP2K-150	1FM-315	AF Plate Bypass
C34	150		48125	1468-00015	5W5T15	GP2K-150	1FM-315	AF Plate Bypass
C35	5000		73473	1467-005	1D5D5	811-005	29C1	AVC Filter
C36	.01	400	71925	P488-01	GT4S1	GP2-335-01	TM-11	Audio Coupling
C37	.01	400	71925	P488-01	GT4S1	GP2-335-01	TM-11	Audio Coupling
C38	.02	400	73638	P488-02	GT4S2		TM-12	Audio Coupling
C39	.0035	1000	70646	P1088-0033	GT16D3		MB-23	Output Plate Bypass
C40	.0035	1000	70646	P1088-0033	GT16D3		MB-23	Output Plate Bypass
C41	47		39042	1468-00005	5W5Q5	GP1K-47	1FM-45	Mixer Fil. Bypass
C42	.01	200	71923	P488-01	GT2S1	GP2-335-01	TM-11	1st IF Fil. Bypass
C43	5000		73473	1467-005	1D5D5	811-005	29C1	2nd IF Fil. Bypass
C44	150		48125	1468-00015	5W5T15	GP2K-150	1FM-315	Output Screen Bypass

Note. Not Used In CH RC-618B.

PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	RATING: IMPEDANCE SEC.	RATING: DC RES. PRI.	RATING: DC RES. SEC.	REPLACEMENT DATA: RCA PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.	INSTALLATION NOTES
T2	12KΩ CT	3.8Ω	600Ω CT	.4Ω	73636	A-3823	A-2936	RO-110	

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA: RCA PART No.	REPLACEMENT DATA: JENSEN PART No.	REPLACEMENT DATA: QUAM PART No.	INSTALLATION NOTES
SP1	FIELD	V.C. IMP.	73635	ST-102# MOD.P12-S	12A6A	# Replace Output Transformer To Match 6-8Ω Voice Coil.
	PM	3.8Ω				
SP2	CONE DIA. 12"	V.C. DIA. 1 1/2"	73934			

R F COILS

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: RCA PART No.	REPLACEMENT DATA: MEISSNER PART No.	
L1	FM Ant.	0Ω		72555		Dipole In Cabinet
L2A	Loop Ant.	2.5Ω		73896		Models 9W101, 9W103
B	Loop Ant.			74300		Model 9W105
L3	FM Ant.Coil	0Ω		73918		
L4	FM Osc.Coil	0Ω		73916		
L5	AM Osc.Coil	1Ω	6.5Ω	73744		Pick Up Coil Resistance 2Ω
L6A	1st FM IF	.3Ω	.3Ω	73745		
B	1st AM IF	8Ω	8Ω			
L7A	2nd FM IF	.8Ω	.8Ω	74019		
B	2nd AM IF	7Ω	7Ω			
L8	Ratio Det.	.9Ω	.3Ω	73743		
L9	Filament Choke	.5Ω		71942		

DIAL LIGHTS

ITEM No.	BASE TYPE	VOLTS	AMPS.	BEAD COLOR	REPLACEMENT DATA: RCA PART No.	REPLACEMENT DATA:	NOTES
M1	Bayonet	7.5	.2	White	11765		Type #51
M2	Bayonet	7.5	.2	White	11765		Type #51
M3	Bayonet	7.5	.2	White	11765		Type #51

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA: RCA PART No.	REPLACEMENT DATA: ASTATIC PART No.	REMARKS
M4		CQ-J	Models 9W101, 9W103

MISCELLANEOUS

ITEM No.	PART NAME	RCA PART No.	NOTES
M5	Switch	74201	Band
M6	Switch	73891	Tone
M7	2 Gang Var.Cap.	73889	(19-434MMF, 27-205MMF)
	Dial Scale	74203	Models 9W101, 9W103
	Dial Scale	74204	Model 9W105
	Dial Pointer	73895	

PARTS LIST AND DESCRIPTIONS (Continued)

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA			INSTALLATION NOTES
	RESISTANCE	WATTS	RCA PART No.	IRC PART No.	CLAROSTAT PART No.	
R1A	1.5Meg.	½	70342	Q18-139XX	T-95	Volume control, tapped @ 250KΩ & 500KΩ
B	Switch		Not Req.	76-1	SW-A	Attach to R1A per instructions

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		IDENTIFICATION CODES
	RESISTANCE	WATTS	RCA PART No.	IRC PART No.	
R2	3.9 Meg.	½		BTS-3.9 Meg.	Conv. Grid
R3	33KΩ	½		BTS-33K	Conv. Plate Decoupling
R4	18KΩ	½		BTS-18K	Osc. Grid
R5	27KΩ	1		BTA-27K	Osc. Plate Decoupling
R6	2.2 Meg.	½		BTS-2.2 Meg.	AVC Network
R7	560Ω	½			Parasitic Supp.
R8	100Ω	½			Parasitic Supp.
R9	100KΩ	½		BTS-100K	AVC Network
R10	270KΩ	½		BTS-270K	Diode Load
R11	68Ω	½		BW-½-68	1st IF Cathode
R12	27KΩ	½		BTS-27K	1st IF Screen
R13	680Ω	½		BTS-68	Decoupling
R14	56KΩ	1		BTA-56K	Diode Filter
R15	120Ω	½		BW-½-120	2nd FM IF Cathode
R16	15KΩ	½		BTS-15K	2nd FM IF Screen
R17	680Ω	½		BTS-680	2nd FM IF Decoupling
R18	100Ω	½		BW-½-100	Balancing
R19	10KΩ	½		BTS-10K	De-emphasis
R20	15KΩ	½		BTS-15K	De-emphasis
R21	3300Ω 5%	½		BTS-3300-5%	Ratio Det. Diode Load
R22	1200Ω 5%	½		BTS-1200-5%	Balancing
R23	39KΩ	½		BTS-39K	Ratio Det. Diode Load
R24	470KΩ	½		BTS-470K	AVC Network
R25	22 Meg.	½		BTS-22 Meg.	Delayed AVC
R26	15KΩ	½		BTS-15K	Tone Compensation
R27	27KΩ	½		BTS-27K	Tone Compensation
R28	10 Meg.	½		BTS-10 Meg.	Phase Inv. Grid
R29	82KΩ	½		BTS-82K	Phase Inv. Plate
R30	18KΩ	½		BTS-18K	Tone Compensation See Note
R31	120KΩ	½		BTS-120K	Phono Pre-Amp. Grid
R32	5600Ω	½		BTS-5600	Tone Compensation
R33	10KΩ	½		BTS-10K	Phono Pre-Amp. Cathode
R34	220KΩ	½		BTS-220K	Phono Pre-Amp. Plate
R35	22KΩ	½		BTS-22K	Filter
R36	330KΩ	½		BTS-330K	Tone Compensation
R37	10 Meg.	½		BTS-10 Meg.	AF Grid
R38	270KΩ	½		BTS-270K	AF Plate
R39	470KΩ	½		BTS-470K	Output Grid
R40	8200Ω	½		BTS-8200	Output Grid
R41	470KΩ	½		BTS-470K	Output Grid
R42	470Ω	2		BW-2-470	Output Cathode Wire Wound
R43	100Ω	½			Parasitic Supp.
R44	2200Ω	5	73637	AB-2250	Filter Wire Wound

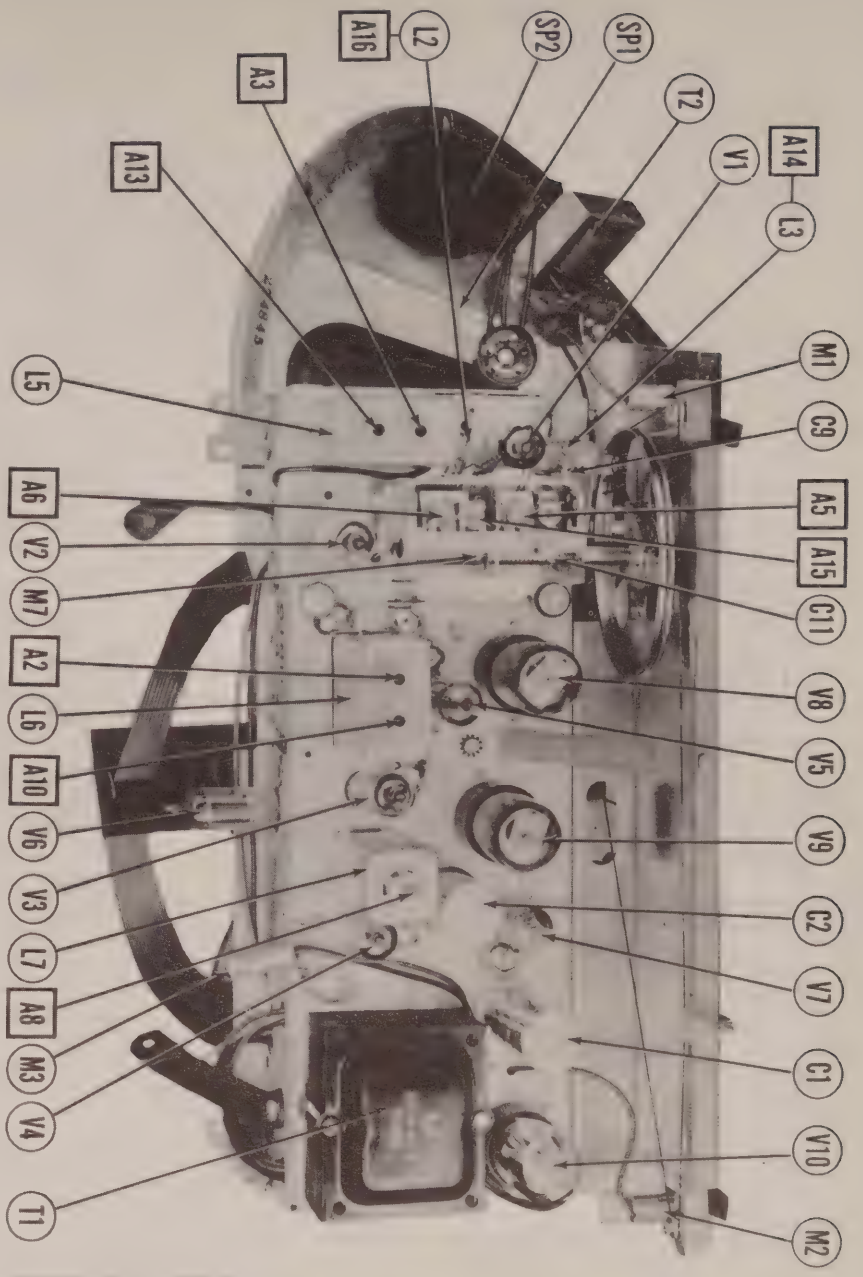
Note - Not Used In CH RC-618B.

TRANSFORMER (POWER)

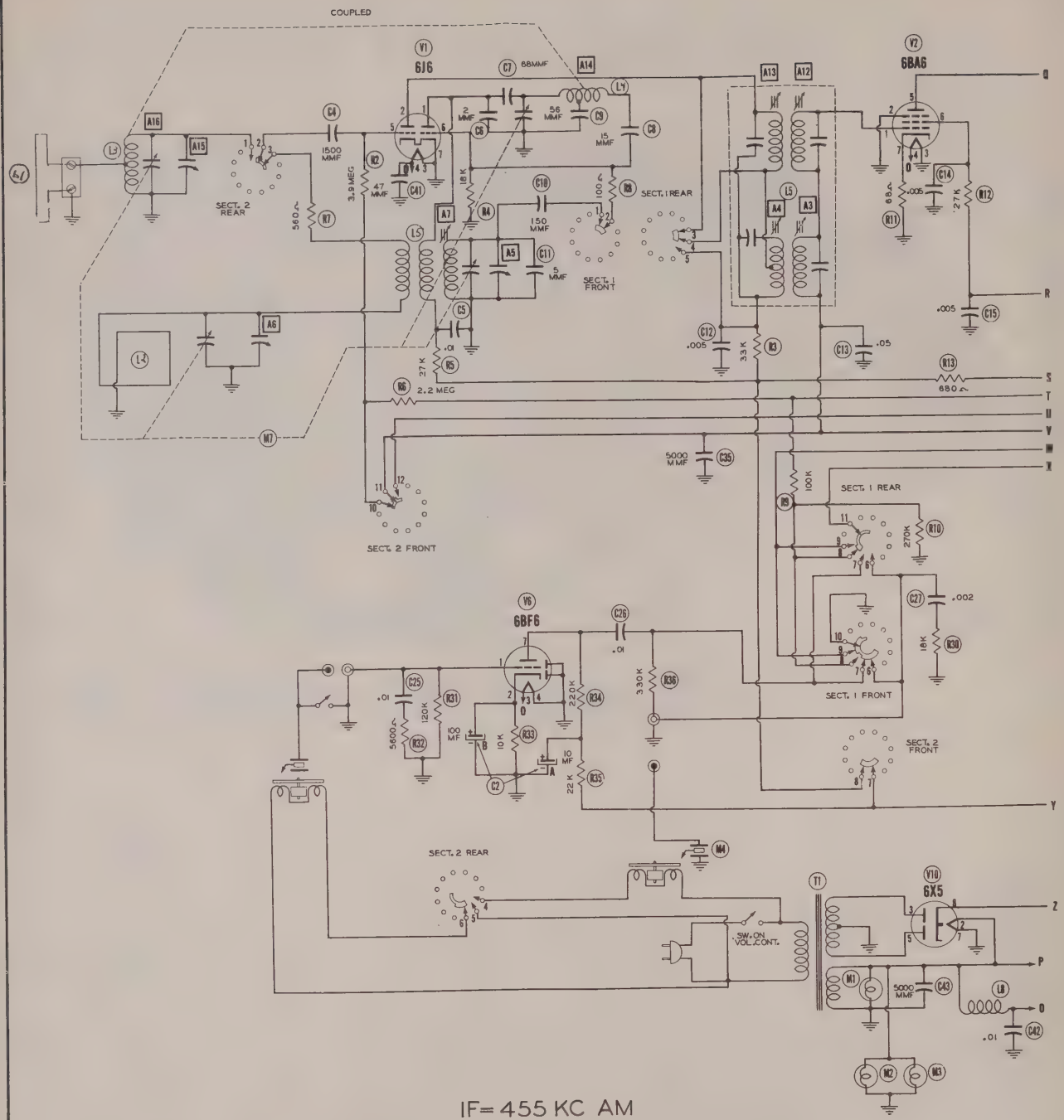
ITEM No.	RATING				REPLACEMENT DATA			
	PRI.	SEC. 1	SEC. 2	SEC. 3	RCA PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.
T1	117VAC @ .57A	550VCT .065A DC	6.3VAC @ 4.3A		73601		P-3048§	

§ Drill New Mounting Holes.

CHASSIS—TOP VIEW



DATE 10/49 SET #73 FOLDER #10



IF = 455 KC AM

IF = 10.7 MC FM

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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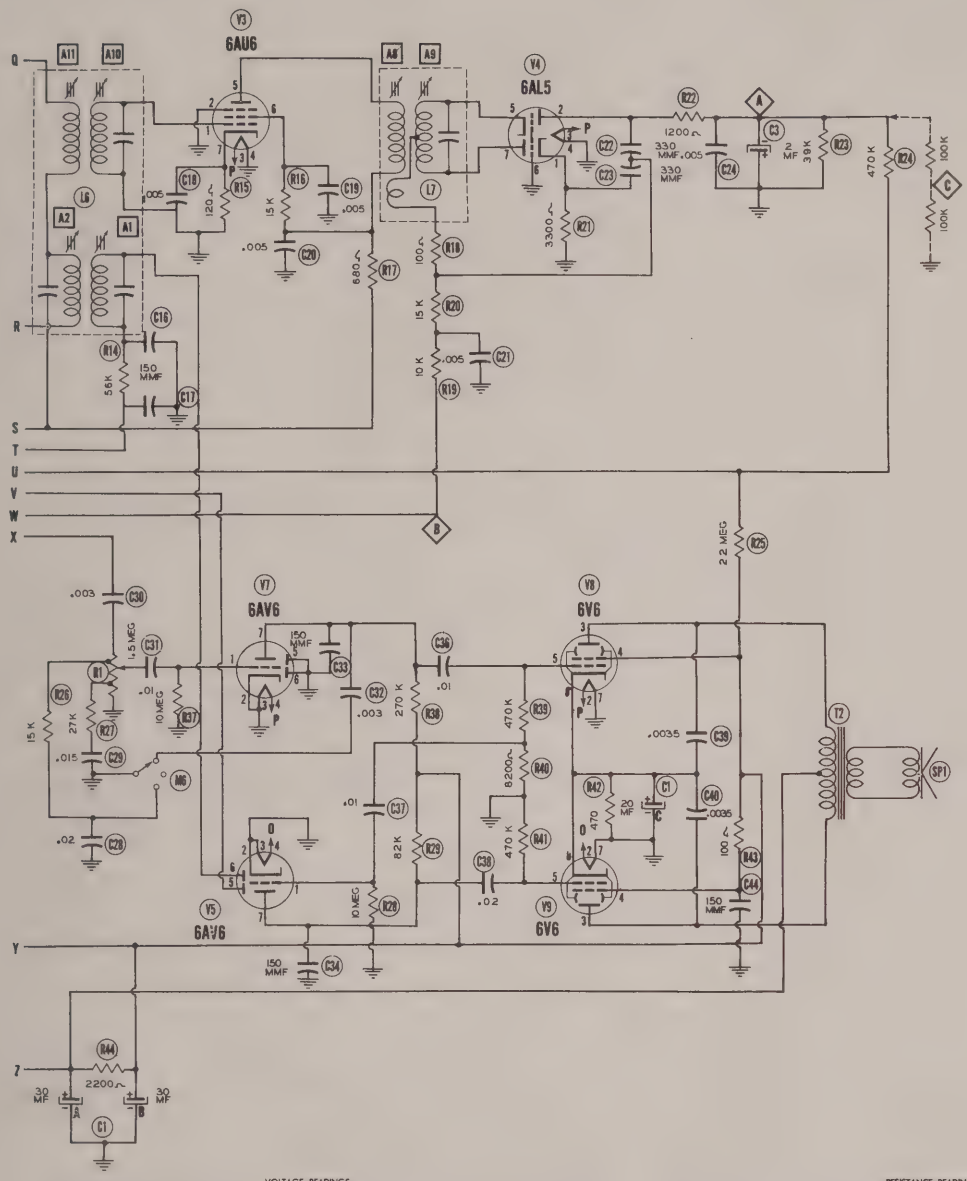

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
	V1A	6J6	73VDC	85VDC	0V	6.3VAC	-.9VDC	§-7.7VDC	0V	
‡	V1B	6J6	45VDC	87VDC	0V	6.3VAC	-1.2VDC	§-4.4VDC	0V	
	V2	6BA6	-.5VDC	0V	0V	6.3VAC	235VDC	175VDC	1VDC	
‡	V3	6AU6	0V	0V	6.3VAC	0V	230VDC	230VDC	0V	
‡	V4	6AL5	.1VDC	-.8VDC	6.3VAC	0V	-.4VDC	0V	-.4VDC	
	V5	6AV6	-.4VDC	0V	0V	6.3VAC	-.5VDC	-.4VDC	135VDC	
	V6	6BF6	0V	5.7VDC	0V	6.3VAC	0V	0V	95VDC	
	V7	6AV6	-.5VDC	0V	0V	6.3VAC	0V	0V	90VDC	
	V8	6V6GT	0V	6.3VAC	290VDC	250VDC	0V	0V	0V	16VDC
	V9	6V6GT	0V	6.3VAC	290VDC	250VDC	0V	0V	0V	16VDC
	V10	6X5GT	0V	6.3VAC	270VAC	0V	270VAC	0V	0V	300VDC

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
	V1A	6J6	†30KΩ	†3.6KΩ	0Ω	.1Ω	6.4 Meg.	16KΩ	0Ω	
‡	V1B	6J6	†30KΩ	†36KΩ	0Ω	.1Ω	6.4 Meg.	16KΩ	0Ω	
	V2	6BA6	2.5 Meg.	0Ω	0Ω	.1Ω	†3KΩ	†30KΩ	68Ω	
‡	V3	6AU6	0Ω	0Ω	.1Ω	0Ω	†3.5KΩ	†16KΩ	120Ω	
‡	V4	6AL5	3.3KΩ	40KΩ	.1Ω	0Ω	Inf.	0Ω	Inf.	
	V5	6AV6	10 Meg.	0Ω	0Ω	.1Ω	2.5 Meg.	420KΩ	†85KΩ	
	V6	6BF6	120KΩ	10KΩ	0Ω	.1Ω	0Ω	0Ω	†250KΩ	
	V7	6AV6	10 Meg.	0Ω	0Ω	.1Ω	0Ω	0Ω	†270KΩ	
	V8	6V6GT	0Ω	.1Ω	†600Ω	†2.2KΩ	470KΩ	8KΩ	0Ω	470Ω
	V9	6V6GT	0Ω	.1Ω	†600Ω	†2.2KΩ	470KΩ	Inf.	0Ω	470Ω
	V10	6X5GT	0Ω	.1Ω	180Ω	Inf.	170Ω	Inf.	0Ω	40KΩ

‡ Taken in FM position.
† Measured from pin 8 of V10

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

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ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

When complete receiver alignment is to be performed, it should be done in the order given. In the event of replacement of a part in the AM IF section it will be necessary to realign the FM IF section.

To set dial pointer, turn tuning gang fully closed and set pointer to the calibration mark on the low frequency end of the dial back plate.

AM ALIGNMENT

Loop should be maintained in same relative position to chassis as when receiver is in cabinet. Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

When aligning the AM IF transformers connect a 47KΩ resistor across the primary of the transformer being aligned and adjust the secondary.

When adjusting the primary move the resistor to the secondary winding; do this for both transformers as they are aligned.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.01MFD	High side to stator of AM antenna section of tuning gang (rear section). Low side to chassis.	455KC (400∿ Mod.)	AM (third pos. clockwise)	Tuning gang fully closed	Across voice coil	A1,A2, A3,A4	Alternately load the primary and secondary windings as described above. Adjust for maximun output.
2.		Loop	1400KC	"	Set pointer 5 1/16" to the right of calibration mark.	"	A5,A6	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		Loop	600KC	"	Set pointer 1" to the right of calibration mark.	"	A7	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output. Repeat steps 2 and 3 until no further improvement can be made.

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
7.	300Ω carbon res.	High side thru 300Ω to right hand FM antenna terminal. Low side to chassis.	106MC (Unmod.)	FM	Set pointer 5" to the right of calibration mark.	DC Probe to Point (A) Common to chassis.	A14, A15	Turn A15 tight (maximum clockwise). Expand or compress coil turns for maximum deflection. Adjust A15 for maximum deflection.
8.	"	"	90MC (Unmod.)	"	Set pointer 1 5/8" to the right of calibration mark.	"	A16	Expand or compress coil turns for maximum deflection. Recheck step 7. If necessary, repeat steps 7 and 8.

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect two matched 100KΩ (± 1%) resistors in series from Point A to chassis. The junction of these two resistors is alignment Point C as shown on the schematic.

When aligning the FM IF transformers, connect a 680Ω resistor across the primary of the transformer being aligned and adjust the secondary.

When adjusting the primary move the resistor to the secondary winding, do this for both IF interstage transformers but not the detector transformer.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
4.	.01MFD	High side to pin 1 (Grid) of 6AU6 (V3). Low side to chassis.	10.7MC (Unmod.)	FM (max. clockwise)	Tuning gang fully closed	DC Probe to Point (A) Common to chassis.	A8	Adjust for maximum deflection.
5.	.01MFD	"	"	"	"	DC Probe to Point (B) Common to Point (C)	A9	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
6.	300Ω carbon res.	High side thru 300Ω to the right hand FM antenna terminal. Low side to chassis.	"	"	"	DC Probe to Point (A) Common to chassis.	A10, A11, A12, A13	Alternately load the primary and secondary windings as described above. Adjust for maximum deflection.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
4.	.01MFD	High side to pin 1 (Grid) of 6BA6 (V2). Low side to chassis.	10.7MC (450KC Sweep)	FM (max. clockwise)	Point of non interference	Vert.Amp. to Point (A) Low Side to chassis.	A8,A10 A11	Disconnect stabilizer capacitor C3. Adjust for maximum amplitude and symmetry as per Fig 1.
5.	300Ω carbon res.	High side thru 300Ω to right hand FM antenna terminal. Low side to chassis.	"	"	"	"	A12, A13	"
6.	"	"	"	"	"	Vert.Amp. to Point (B) Low side to chassis.	A8,A9	Reconnect stabilizer capacitor C3. Adjust A9 so 10.7MC occurs at center of crossover lines as per Fig 2. Slightly retouch A8 for maximum amplitude and straightness of cross-over lines.

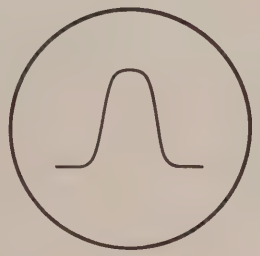

FIG. 1

FIG. 2

CRITICAL LEAD DRESS

1. Keep leads of C10 short.
2. Dress R8 away from range switch and pin No. 5 of V1.
3. The round lead of pin No. 2 of V2 and V3 should be down against chassis. Its length is critical.
4. The AVC lead from R24 to range switch should be dressed against chassis and away from 6AU6 driver tube socket.
5. C9 should have short leads and the color code of the capacitor should go to the coil L4. The capacitor should be cemented down with polystyrene cement at the same time L3 is cemented.
6. The lead from the high side of the loop should be dressed away from tubes.
7. Lead from pin No. 2 of V1 to terminal "A" of 1st IF transformer should be dressed against the chassis.
8. Connect C7 directly between the gang condenser and pin No. 1 of V1.
9. Make all FM leads as short as possible.
10. Dress lead from pin No. 5 of V2 to terminal "A" of 2nd IF transformer down against chassis.
11. Dress resistor R37 near chassis base.
12. Dress all AC leads away from volume control.
13. The lead from "FM" terminal of antenna terminal board to L2 tap should be dressed away from V2.
14. The taps on L2 and L3 are critical. L2 tap should be 3/4 turn from the ground end. L3 tap should be 2 1/2 turns from the gang condenser.
15. Dress C41 and C42 against the chassis with the shortest lead length possible.
16. The position of L2 and L3 is critical. L2 should be midway between V1 and the 1st IF transformer. The end of L3 should be approximately 3/16" from V1.
17. Capacitor C5 should be secured to the chassis apron with melted wax or cement.
18. FM oscillator coil L3 must be cemented to its support. Amphenol No. 912 cement is recommended for this purpose.

PHOTOFACT* Folder

*TRADE MARK

SENTINEL MODELS
400-TV, 405-TVM

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MODEL 400-TV

SENTINEL MODELS
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SENTINEL MODELS 400-TV, 405-TVM

SENTINEL MODELS 400-TV, 405-TVM

SENTINEL MODEL 400-TV

TRADE NAME Sentinel, Models 400-TV, 405-TVM
MANUFACTURER Sentinel Radio Corp., 2100 W. Dempster, Evanston, Illinois
TYPE SET TV Receiver
TUBES Twenty-One

POWER SUPPLY 110-120 Volts AC
TUNING RANGE—Channels 2 thru 13 RATING: 1.18 Amp. @ 117 Volts AC

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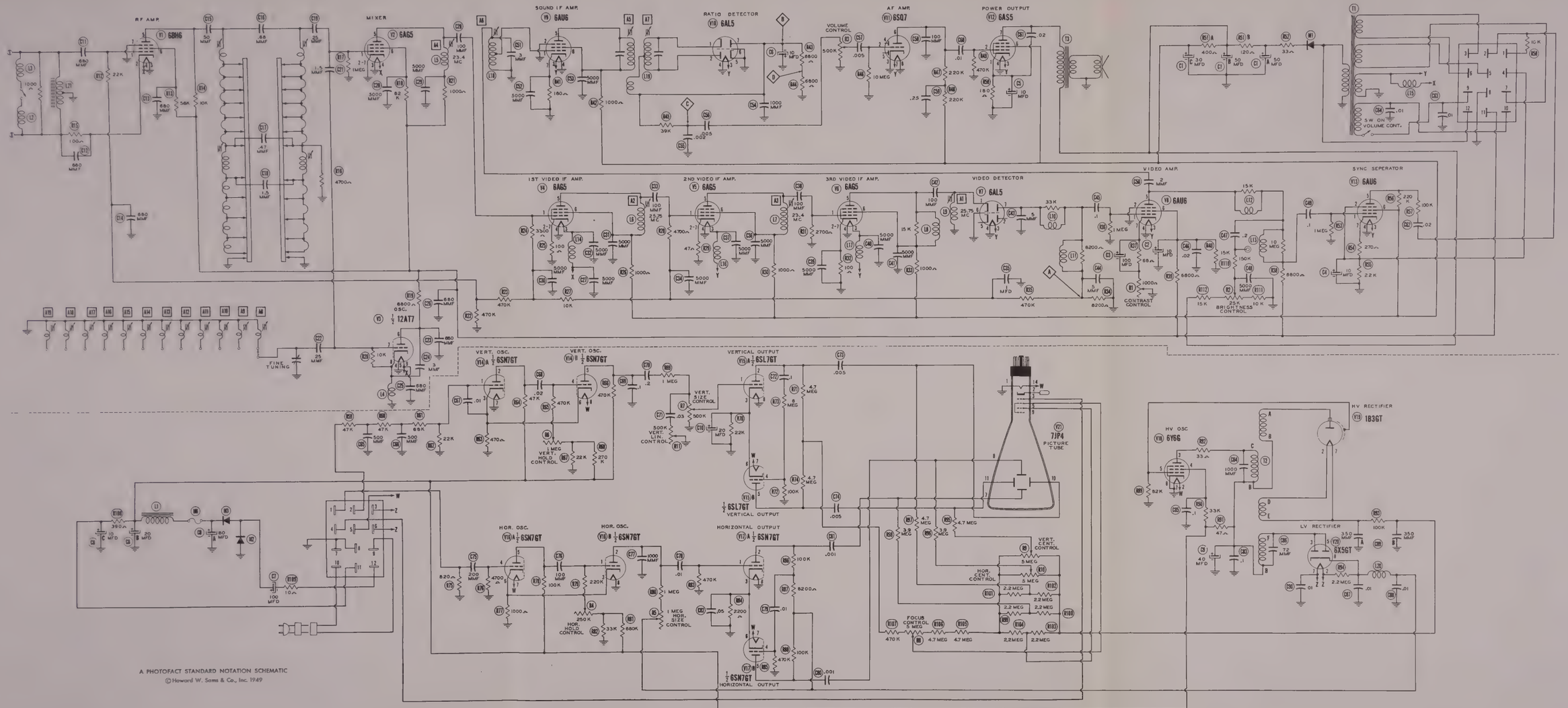

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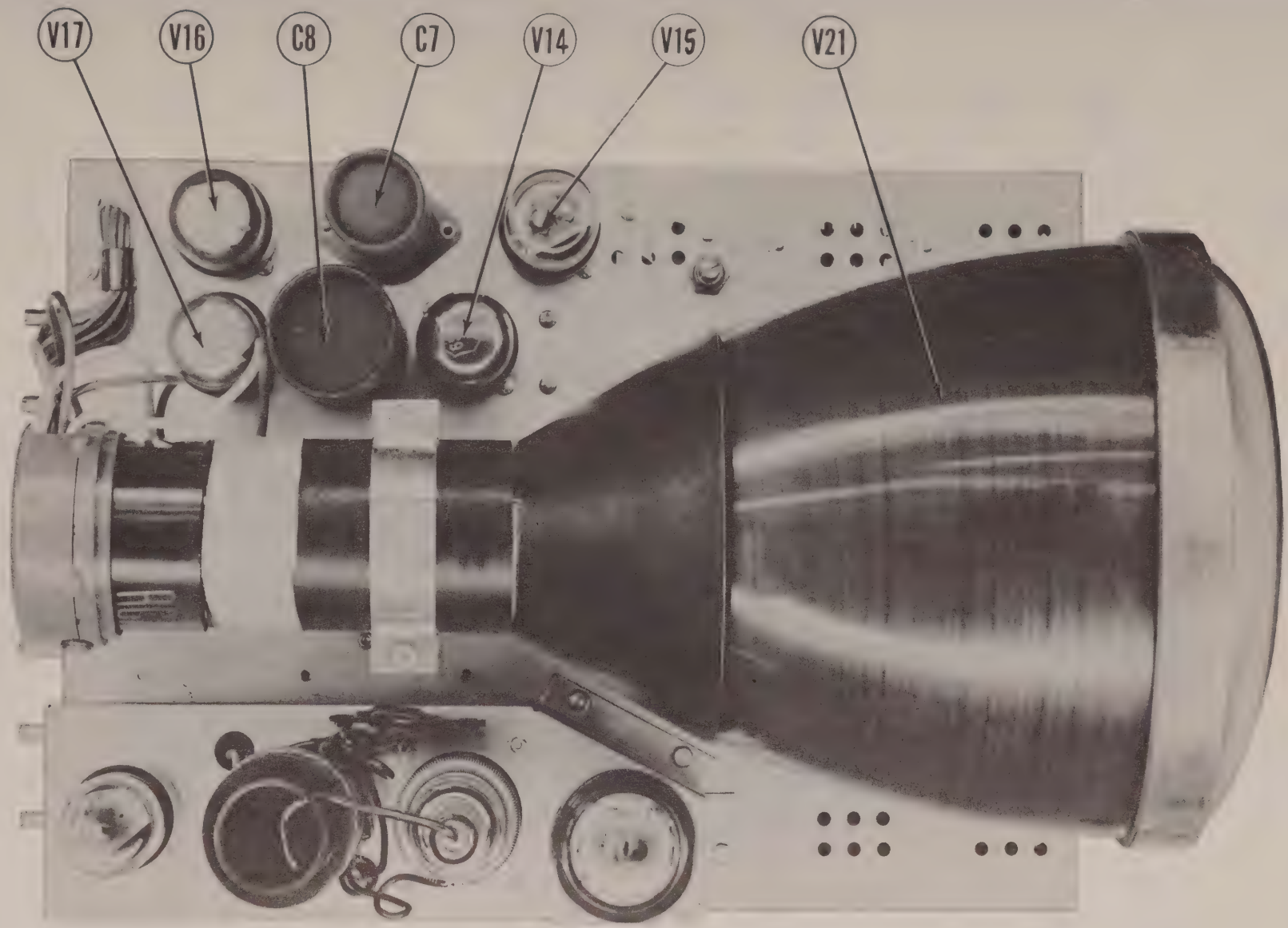
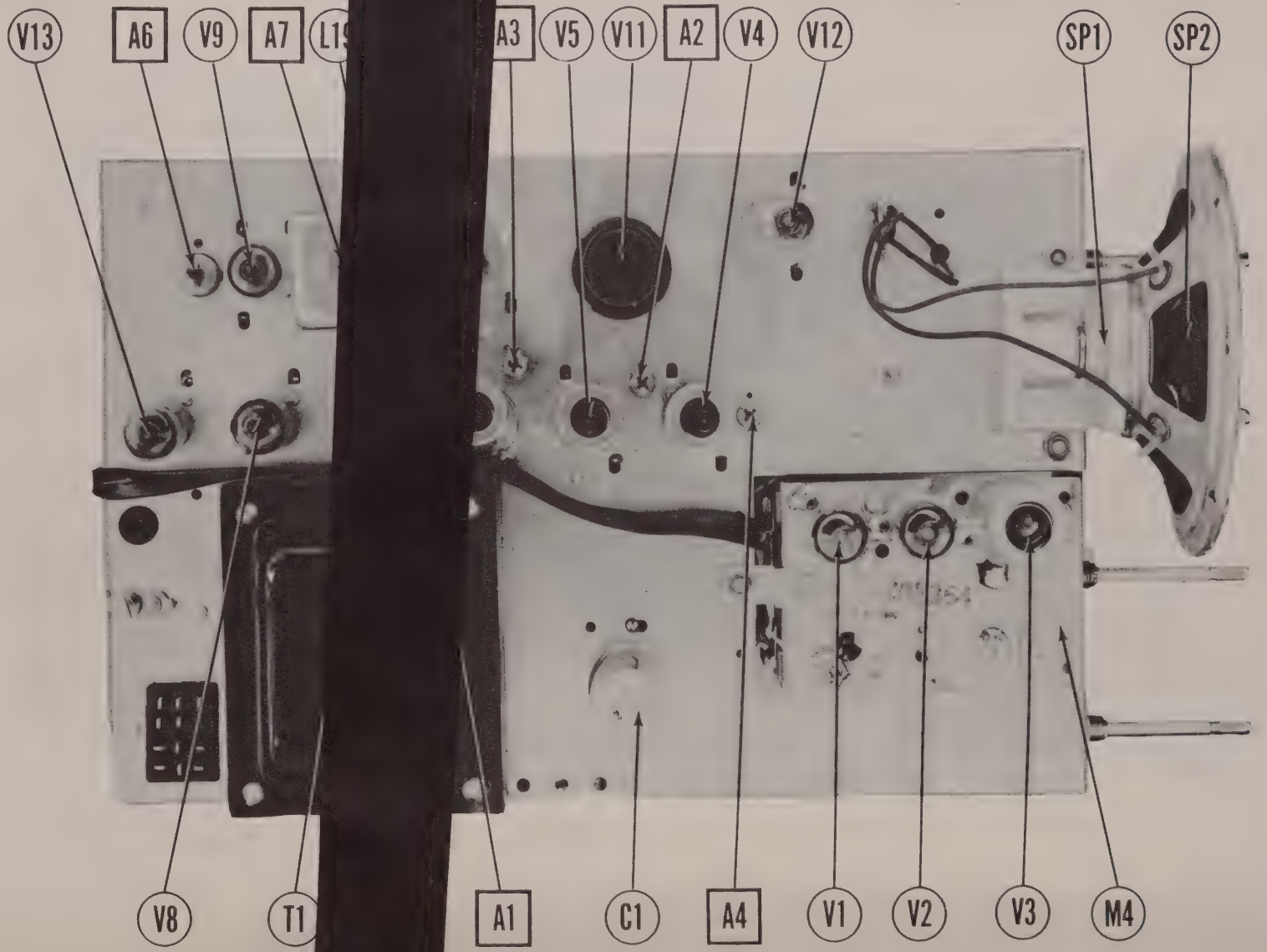


SWEEP CHASSIS-TOP VIEW



F-IF CHASSIS-TOP VIEW

ALIGNMENT INSTRUCTIONS

VIDEO IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Remove the local oscillator tube V3 to prevent erroneous indications.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.		High side to ungrounded tube shield floating over mixer tube (V2). Low side to chassis.	25.75MC (Unmod.)	Any	DC Probe to Point (A) Common to chassis.	A1,A2	Adjust for maximum deflection.
2.		"	23.4MC (Unmod.)	"	"	A3,A4	"

OVERALL VIDEO IF RESPONSE CHECK

Connect the synchronized sweep voltage from the signal generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
3.		High side to ungrounded tube shield floating over mixer tube (V2). Low side to chassis.	24MC (10MC Sweep)	25.75MC 23.4MC	Any	Vert. Amp. to Point A. Low side to chassis.		Check for response as per Fig 1, with markers as shown. If necessary, slightly retouch A1 thru A4 for proper response.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
4.	.01MFD	High side to pin 5 (plate) of 6AU6 (V8). Low side to chassis.	4.5MC (Unmod.)	Any	DC Probe to Point (B) Common to chassis.	A5,A6	Adjust for maximum deflection.
5.	.01MFD	"	"	"	DC Probe to Point (C) Common to Point (D)	A7	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
4.	.01MFD	High side to pin 1 (Grid) of 6AU6 (V8). Low side to chassis.	4.5MC (450KC Sweep)	4.5MC	Any	Vert. Amp. to Point (B) Low side to chassis.	A5,A6	Disconnect stabilizer capacitor C6. Adjust A5 and A6 for maximum amplitude as per Fig 2.
5.	.01MFD	"	"	"	"	Vert. Amp. to Point (C) Low side to chassis.	A7,A5	Reconnect stabilizer capacitor C6. Adjust A7 so 4.5MC marker occurs at center of crossover lines as per Fig 3. Slightly retouch A5 for maximum amplitude and straightness of crossover lines.

OSCILLATOR ALIGNMENT

Replace local oscillator tube V3.
The RF and mixer lines are pre-tuned at the factory, and because they are sufficiently broad do not require adjustment in the field.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
6.	Two 150Ω carbon res.	Across antenna terminals with 150Ω in each lead.	213MC (10MC Sweep)	211.25MC 215.75MC	13	Vert. Amp. to Point (A) Low side to chassis.	A8	Check for correct response with marker placement as per Fig 4. It should be noted that each channel's oscillator circuit is individually tuned and only those channels requiring alignment need be adjusted.
			207MC (10MC Sweep)	205.25MC 209.75MC	12		A9	
			201MC (10MC Sweep)	199.25MC 203.75MC	11		A10	
			195MC (10MC Sweep)	193.25MC 197.75MC	10		A11	
			189MC (10MC Sweep)	187.25MC 191.75MC	9		A12	
			183MC (10MC Sweep)	181.25MC 185.75MC	8		A13	
			177MC (10MC Sweep)	175.25MC 179.75MC	7		A14	
			85MC (10MC Sweep)	83.25MC 87.75MC	6		A15	
			79MC (10MC Sweep)	77.25MC 81.75MC	5		A16	
			69MC (10MC Sweep)	67.25MC 71.75MC	4		A17	
			63MC (10MC Sweep)	61.25MC 65.75MC	3		A18	
			57MC (10MC Sweep)	55.25MC 59.75MC	2		A19	

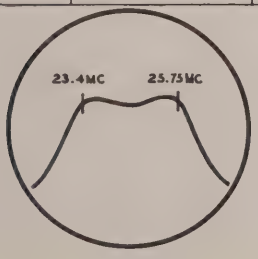


FIG. 1

FIG. 2

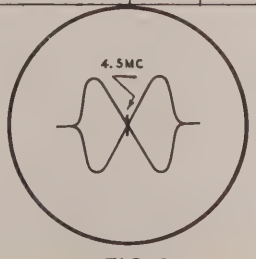


FIG. 3

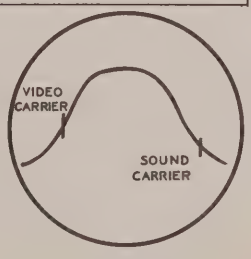
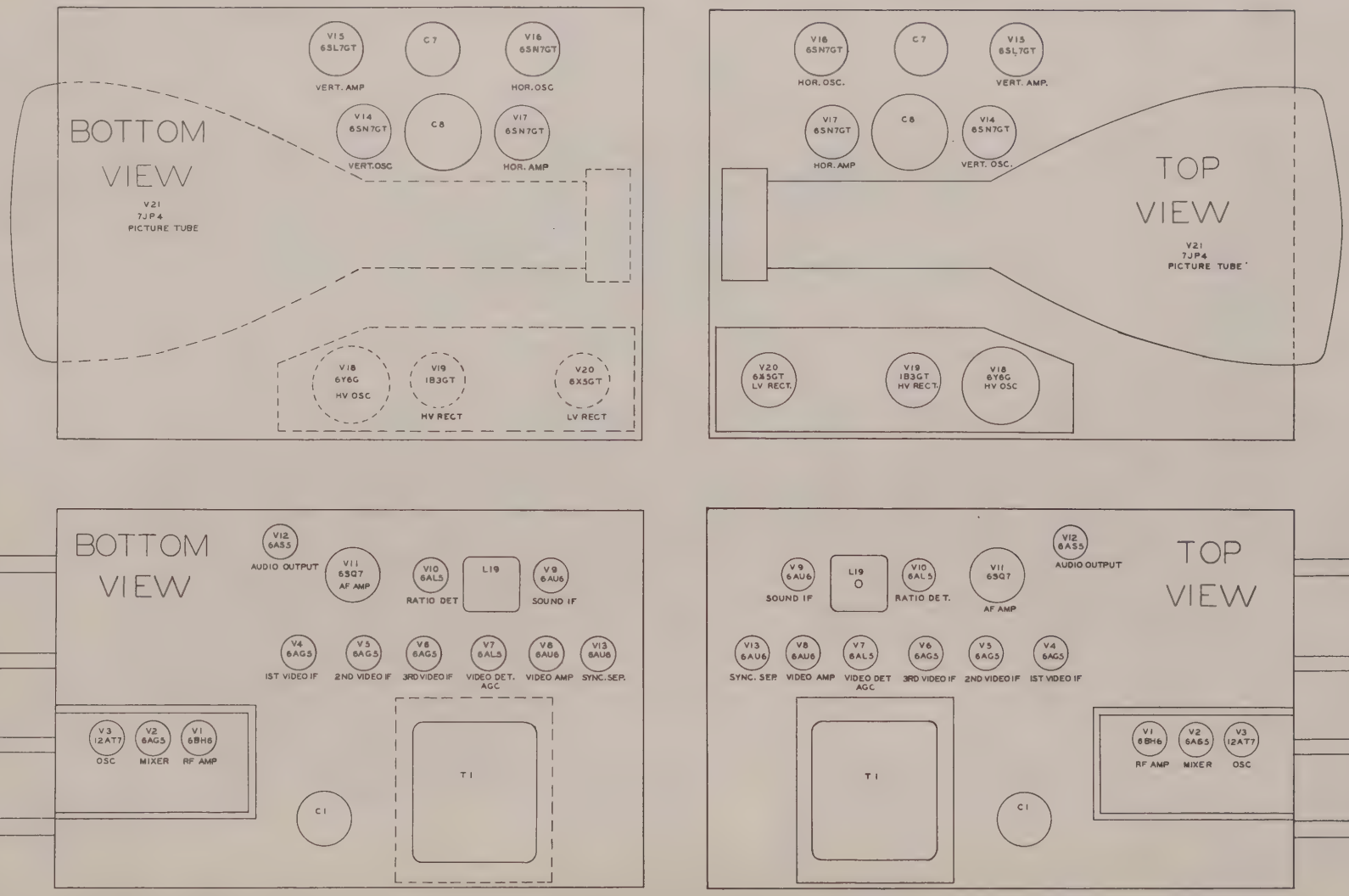


FIG. 4



TUBE PLACEMENT CHART

VOLTAGE AND RESISTANCE MEASUREMENTS

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BH6	-.1VDC	0V	0V	6.3VAC	240VDC	240VDC	0V		
V 2	6AG5	-1.8VDC	0V	0V	6.3VAC	240VDC	135VDC	0V		
V 3	12AT7	0V	0V	0V	0V	0V	180VDC	§-.4VDC	0V	6.3VAC
V 4	6AG5	-.3VDC	.5VDC	6.3VAC	0V	110VDC	110VDC	.5VDC		
V 5	6AG5	-.3VDC	.3VDC	6.3VAC	0V	110VDC	110VDC	.3VDC		
V 6	6AG5	0V	.8VDC	6.3VAC	0V	110VDC	110VDC	.8VDC		
V 7	6AL5	0V	0V	6.3VAC	0V	0V	0V	-.2VDC		
V 8	6AU6	.5VDC	0V	6.3VAC	0V	180VDC	140VDC	12VDC		
V 9	6AU6	0V	0V	6.3VAC	0V	110VDC	110VDC	1.1VDC		
V 10	6AL5	-.2VDC	-.1VDC	6.3VAC	0V	0V	0V	.3VDC		
V 11	6SQ7	0V	-.4VDC	0V	0V	0V	57VDC	6.3VAC	0V	
V 12	6AS5	7.3VDC	0V	6.3VAC	0V	0V	115VDC	117VDC		
V 13	6AU6	0V	3.6VDC	6.3VAC	0V	85VDC	117VDC	3.6VAC		
V 14	6SN7GT	0V	80VDC	2VDC	-2.4VDC -4.6VDC	35VDC	2VDC	0V	6.3VAC	
V 15	6SL7GT	0V 0V	*	2.1VDC	0V	90VDC	2.1VDC	6.3VAC	0V	
V 16	6SN7GT	-1.8VDC -2.2VDC	28VDC 50VDC	2.9VDC	0V	75VDC	2.9VDC	6.3VAC	0V	
V 17	6SN7GT	0V	300VDC	16VDC	0V	345VDC	16VDC	6.3VAC	0V	
V 18	6Y6G	240VDC	6.3VAC	240VDC	135VDC	-6.1VDC	240VDC	0V	0V	
V 19	1B3GT	* DO NOT MEASURE								
V 20	6X5GT	0V	680VDC	260VDC	0V	260VDC	0V	680VDC	750VDC	

	PINS	1	2	3	5	7	8	9	10	11	14
V21	7JP4	0V	162VDC	3.6VDC	*	*	*	*	*	*	6.3VAC

§ Taken with vacuum tube voltmeter.
* Do not measure.

RESISTANCE READINGS

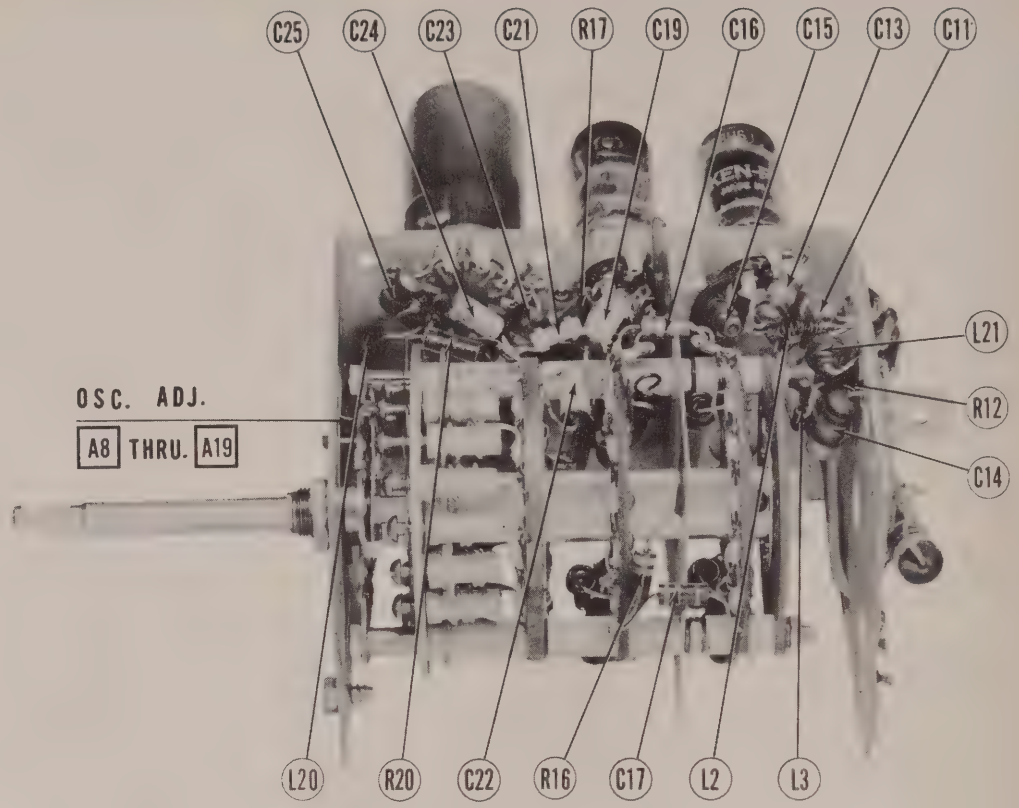
Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BH6	360KΩ	100Ω	0Ω	.1Ω	†10KΩ	†56KΩ	0Ω		
V 2	6AG5	1 Meg.	0Ω	0Ω	.1Ω	†1.5KΩ	†82KΩ	0Ω		
V 3	12AT7	0Ω	0Ω	0Ω	0Ω	0Ω	†7KΩ	10KΩ	0Ω	.1Ω
V 4	6AG5	360KΩ	100Ω	.1Ω	0Ω	↓1.5KΩ	↓1.5KΩ	100Ω		
V 5	6AG5	360KΩ	47Ω	.1Ω	0Ω	↓1.5KΩ	↓1.5KΩ	47Ω		
V 6	6AG5	2.7KΩ	100Ω	.1Ω	0Ω	↓1.5KΩ	↓1.5KΩ	100Ω		
V 7	6AL5	.1Ω	8KΩ	.1Ω	0Ω	Inf.	0Ω	8KΩ		
V 8	6AU6	1 Meg.	0Ω	.1Ω	0Ω	†7.5KΩ	†6.5KΩ	1000Ω		
V 9	6AU6	1Ω	0Ω	.1Ω	0Ω	↓1.5KΩ	↓1.5KΩ	180Ω		
V 10	6AL5	Inf.	Inf.	.1Ω	0Ω	0Ω	0Ω	13.5KΩ		
V 11	6SQ7	0Ω	10 Meg.	0Ω	Inf.	Inf.	↓440KΩ	.1Ω	0Ω	
V 12	6AS5	180Ω	470KΩ	.1Ω	0Ω	470KΩ	↓520Ω	↓400Ω		
V 13	6AU6	1 Meg.	22KΩ	.1Ω	0Ω	↓220KΩ	↓520Ω	22KΩ		
V 14	6SN7GT	22KΩ	†47KΩ	470Ω	1.5Meg. 500KΩ	†470KΩ	470Ω	0Ω	.1Ω	
V 15	6SL7GT	500KΩ 18Ω	Inf.	22KΩ	100KΩ	Inf.	22KΩ	.1Ω	0Ω	
V 16	6SN7GT	500KΩ 250KΩ	♦2 Meg. ♦1 Meg.	1000Ω	4.7KΩ	†100KΩ	1000Ω	.1Ω	0Ω	
V 17	6SN7GT	470KΩ	♦110KΩ	2.2KΩ	470KΩ	♦100KΩ	2.2KΩ	.1Ω	0Ω	
V 18	6Y6G	†180Ω	.1Ω	†200Ω	†33KΩ	82KΩ	†140Ω	0Ω	0Ω	
V 19	1B3GT	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	TOP CAP †750Ω
V 20	6X5GT	Inf.	Inf.	†300Ω	Inf.	†300Ω	Inf.	Inf.	Inf.	

PINS		1	2	3	5	7	8	9	10	11	14
V21	7JP4	0Ω	170KΩ	22KΩ	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	.1Ω

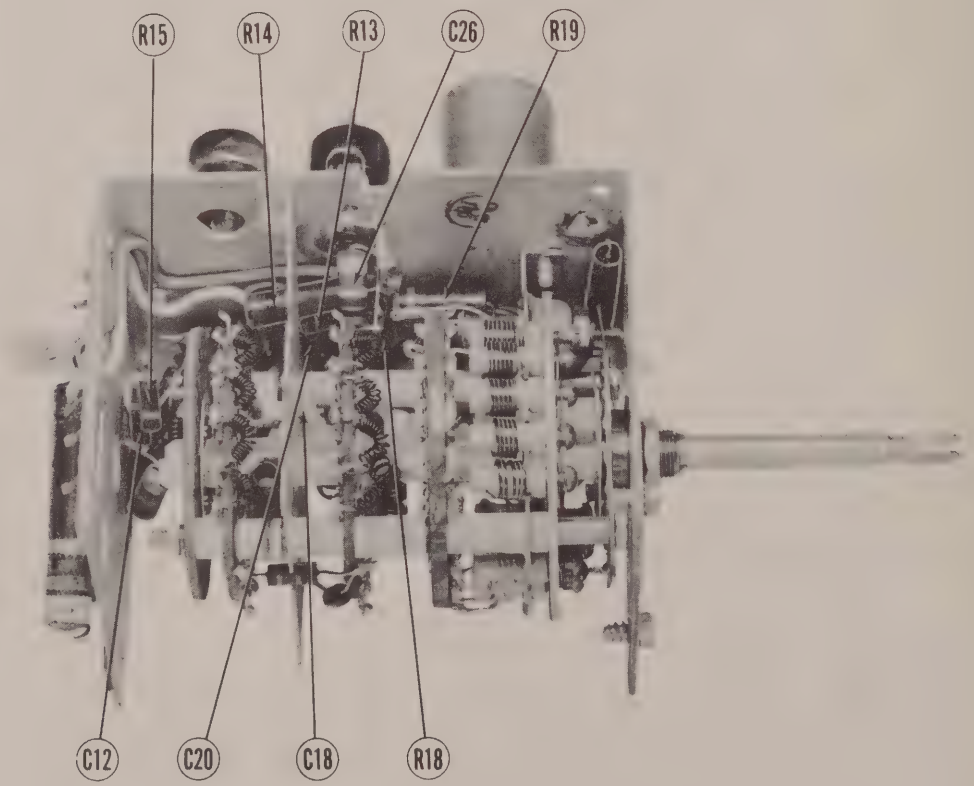
† Measured from output of M3.
↓ Measured from output of M1.
♦ Measured from pin 8 of V20.

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltage measured at 1,000 ohms.
2. Pin numbers are counted in a clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings.
5. Front panels controls set at minimum.
6. Where readings may vary according to the setting of the service controls, both minimum and maximum readings are given.

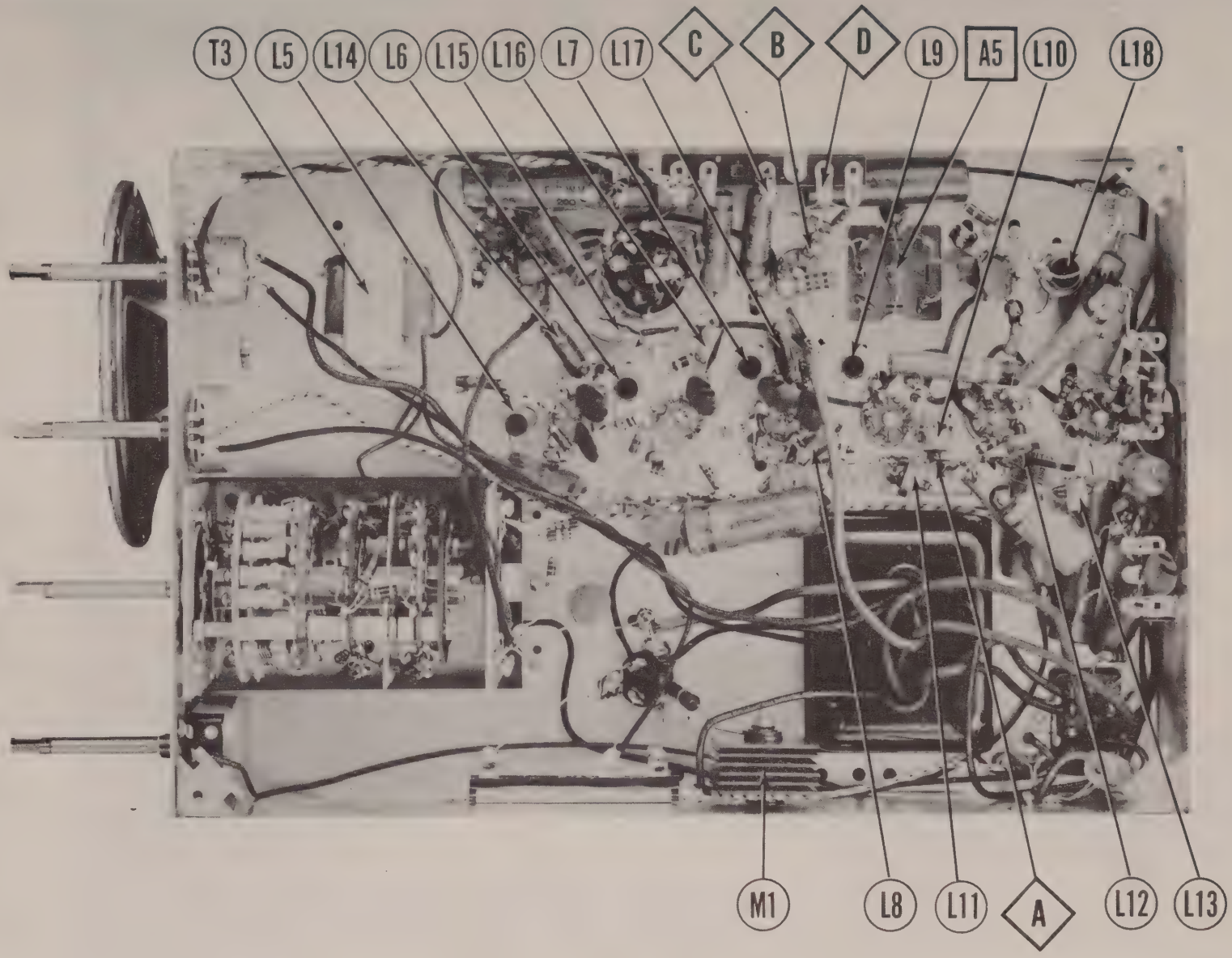
SENTINEL MODELS
400-TV, 405-TVM



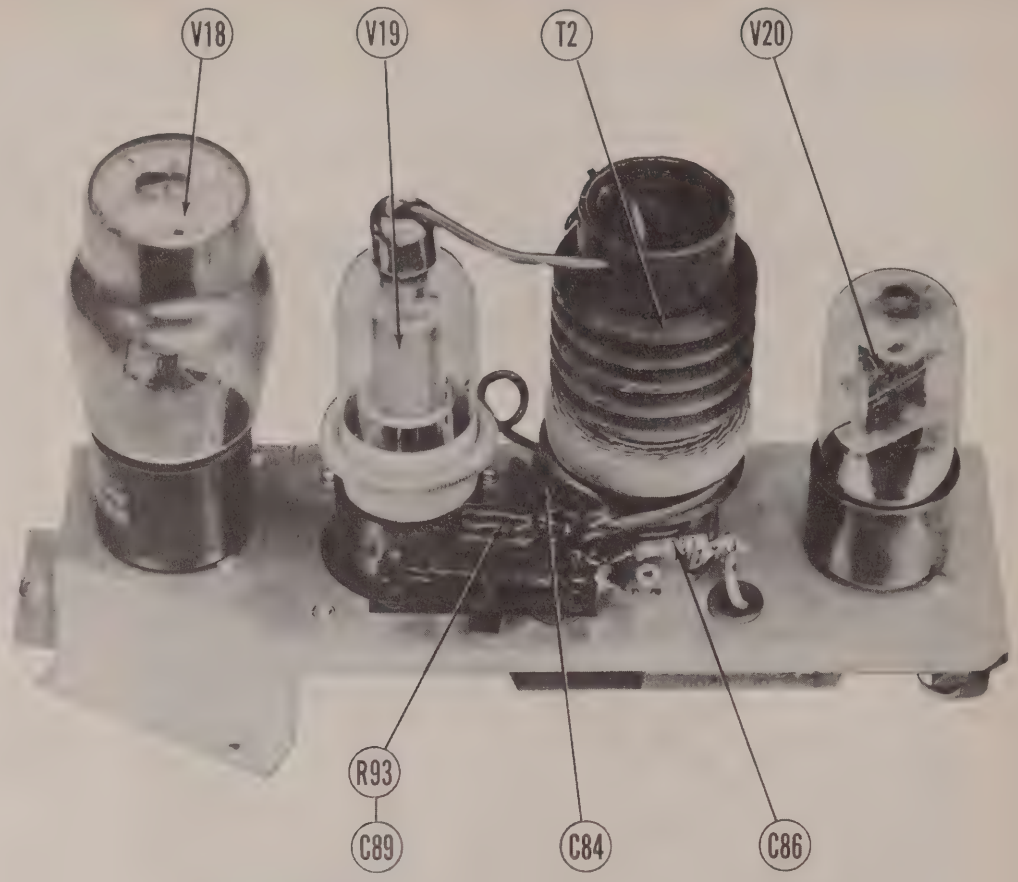
RF TUNER-RIGHT SIDE



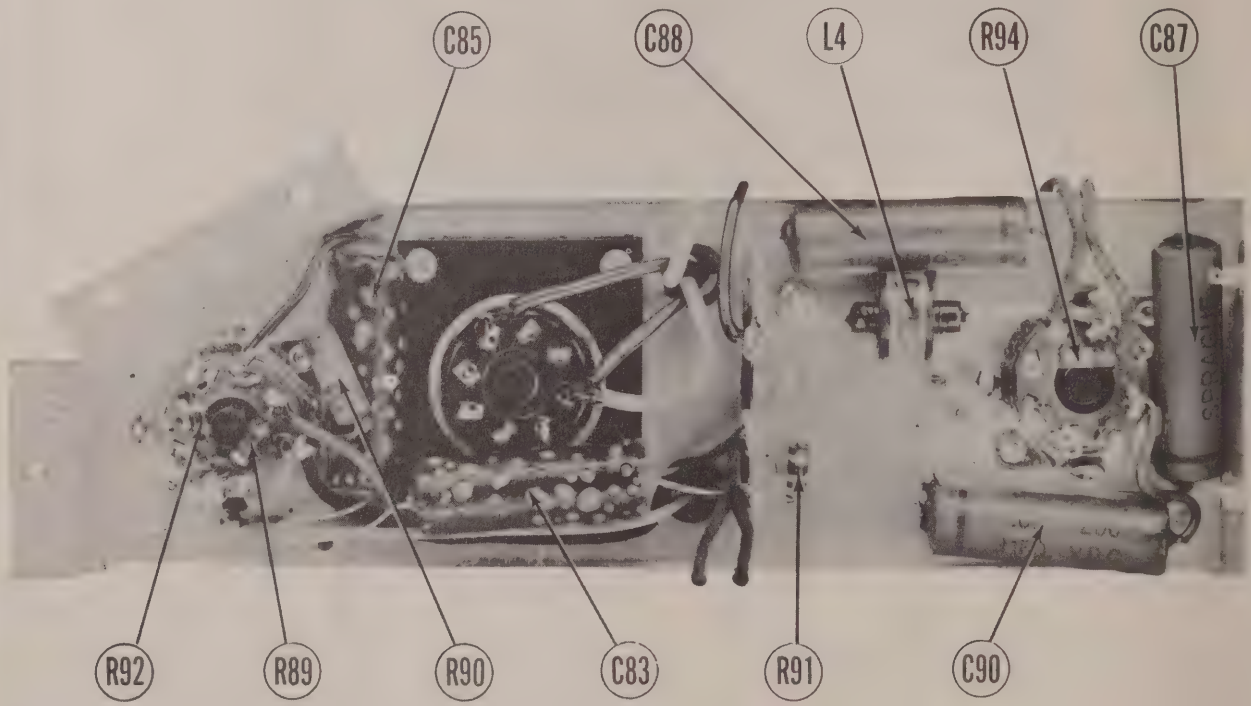
RF TUNER-LEFT SIDE



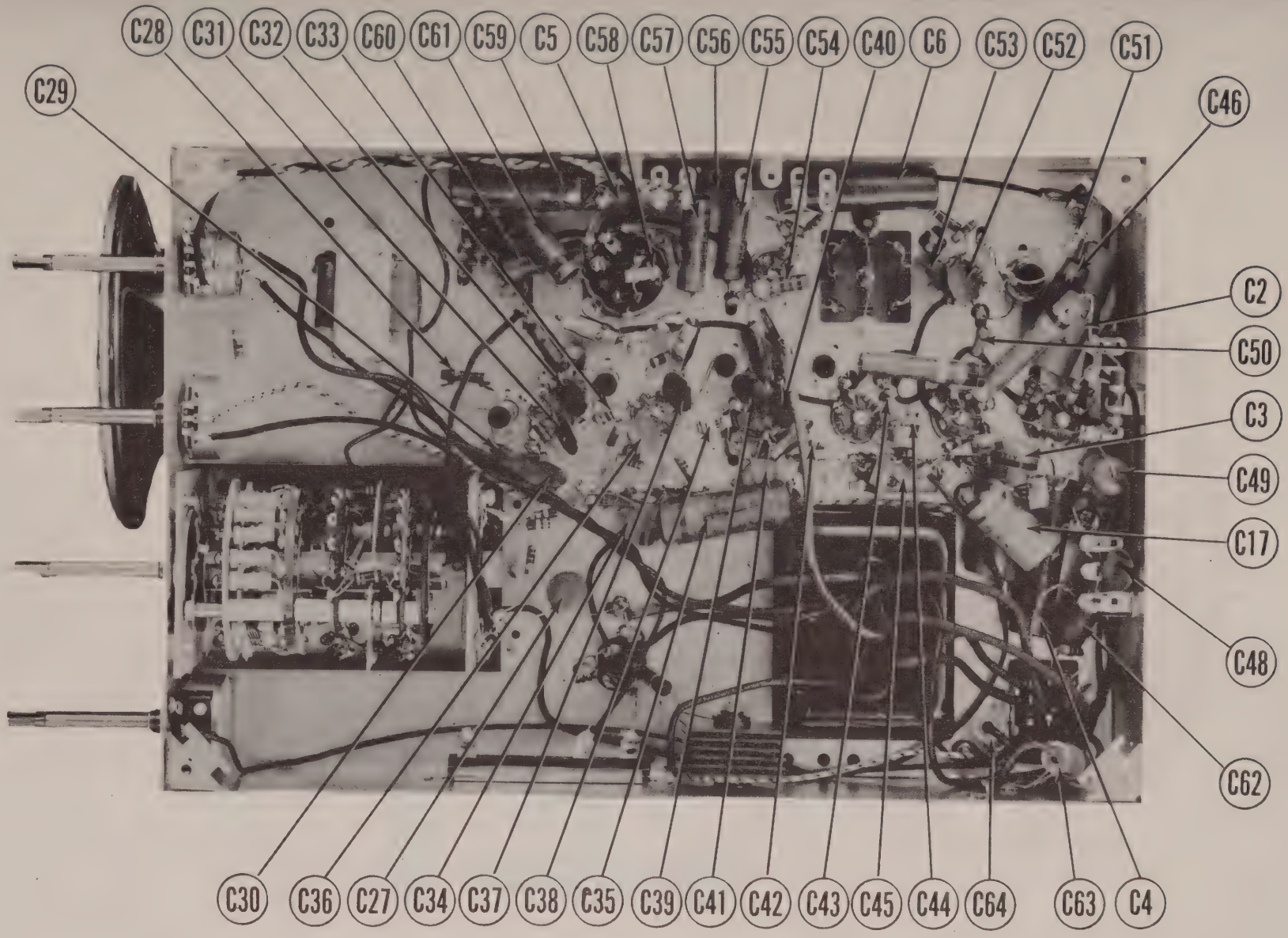
RF-IF CHASSIS- BOTTOM VIEW -TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION



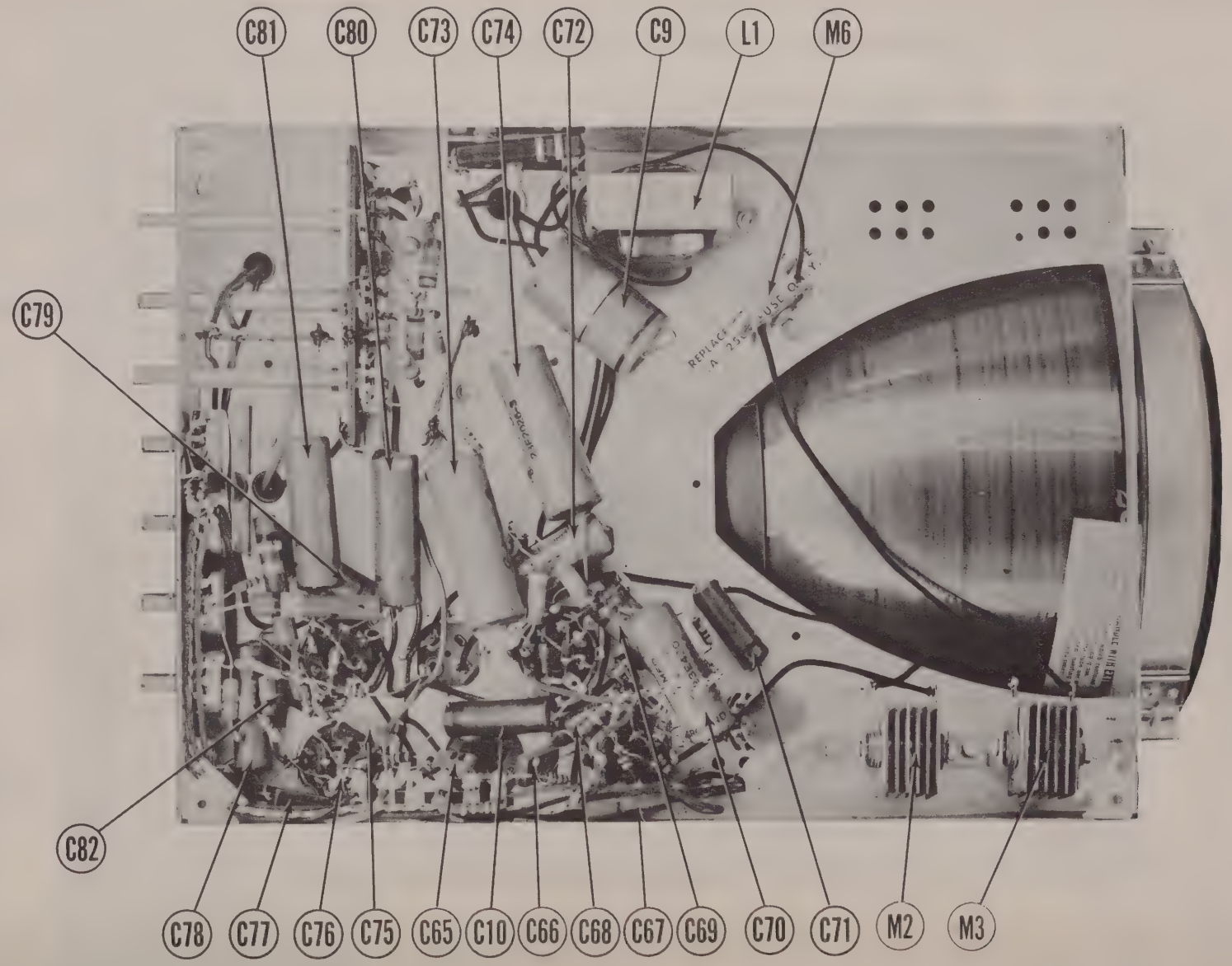
HIGH VOLTAGE SUPPLY - TOP VIEW



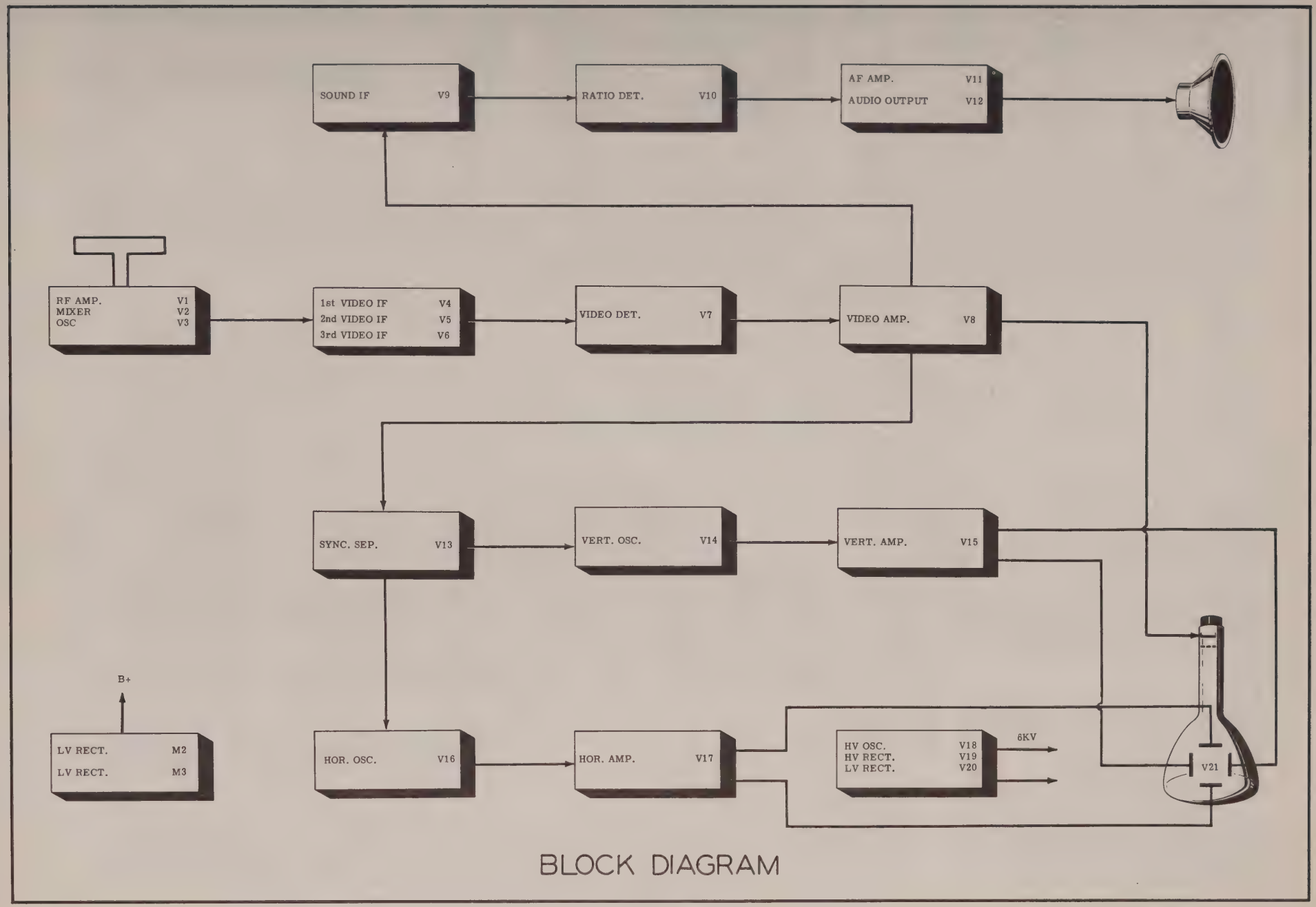
HIGH VOLTAGE SUPPLY - BOTTOM VIEW



RF-IF CHASSIS-BOTTOM VIEW-CAPACITOR IDENTIFICATION



SWEEP CHASSIS-BOTTOM VIEW-CAPACITOR IDENTIFICATION



BLOCK DIAGRAM

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: SENTINEL PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	NOTES
V1	RF Amp.	6BH6	6BH6	7GM	
V2	Mixer	6AG5	6AG5	7BD	
V3	Oscillator	12AT7	12AT7	9A	
V4	1st Video IF Amp.	6AG5	6AG5	7BD	
V5	2nd Video IF Amp.	6AG5	6AG5	7BD	
V6	3rd Video IF Amp.	6AG5	6AG5	7BD	
V7	Video Detector	6AL5	6AL5	6BT	
V8	Video Amp.	6AU6	6AU6	7BK	
V9	Sound IF Amp.	6AU6	6AU6	7BK	
V10	Ratio Detector	6AL5	6AL5	6BT	
V11	AF Amp.	6SN7	6SN7	9Q	
V12	Audio Output	6AS5	6AS5	7CV	
V13	Sync. Sep.	6AU6	6AU6	7BK	
V14	Vert. Osc.	6SN7GT	6SN7GT	9BD	
V15	Vert. Amp.	6SL7GT	6SL7GT	9BD	
V16	Hor. Osc.	6SN7GT	6SN7GT	9BD	
V17	Hor. Amp.	6SN7GT	6SN7GT	9BD	
V18	HV Osc.	6Y6G	6Y6G	7AC	
V19	HV Rectifier	1B3GT	1B3GT	3Q	
V20	LV Rectifier	6X5GT	6X5GT	6S	
V21	Picture Tube	7JP4	7JP4	14G	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: SENTINEL PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	80	150	25E30	AF888D	UP44415		D12112	■ Filter
B	80	150						▲ Filter
C	80	150						● Filter
C2	10	250	25E35	PRS250/12	BR1225		UT-82	Video Amp. Screen Bypass
C3	100	10	25E12	PRS12/100	BRH121		18D8	Video Amp. Cath. Bypass
C4	10	25	25E8	PRS25/10	BBR-10-25T		TVA-5	Sync. Sep. Cath. Bypass
C5	10	25	25E8	PRS25/10	BBR10-25T		TVA-5	Output Cath. Bypass
C6	10	25	25E8	PRS25/10	BBR10-25T		TVA-5	Stabilizing Cap.
C7	100	150	25E32	AF20D	UP6AJ333			Voltage Doubler Cap.
C8A	60	300	25E33	AFH1242G	UP9CJ180			● Filter
B	20	300						■ Filter
C	10	300						▲ Filter
C9	40	300	25E31	PRS450/40	BR4035		UT-40	Decoupling
C10	10	25	25E8	PRS25/25	BBR20-25		TVA-6	Vert. Amp. Cath. Bypass
C11	680					GP2K-680		RF Coupling
C12	680					GP2K-680		RF Cath. Bypass
C13	680					GP2K-680		RF Screen Bypass
C14	680					GP2K-680		AGC Filter
C15	50					GP1K-50		RF Coupling
C16	.68							" "
C17	.47							" "
C18	1.5					NPOK-1.5		" "
C19	25					GP1K-25		" "
C20	5000				1467-005	811-005		Mixer Screen Bypass
C21	1.5					NPOK-1.5	29C1	Osc. Coupling
C22	25					GP1K-25		Osc. Grid Cap.
C23	680					GP2K-680		Osc. Plate Bypass
C24	5					NPOK-5		Osc. Feedback
C25	680					GP2K-680		Osc. Fil. Bypass
C26	680					GP2K-680		RF Bypass
C27	5000		23E2025	1467-005	1D5D5	811-005	29C1	Filament Bypass
C28	100		23E11	1468-0001	5W5T1	GP1K-100	1FM-31	IF Coupling
C29	5000		23E2025	1467-005	1D5D5	811-005	29C1	Mixer Plate Dec.
C30	5000		23E2025	1467-005	1D5D5	811-005	29C1	AGC Filter
C31	5000		23E2025	1467-005	1D5D5	811-005	29C1	1st V. IF Dec.
C32	5000		23E2025	1467-005	1D5D5	811-005	29C1	1st V. IF Fil. Bypass
C33	100		23E11	1468-0001	5W5T1	GP1K-100	1FM-31	IF Coupling
C34	5000		23E2025	1467-005	1D5D5	811-005	29C1	AGC Filter
C35	1.0	200	25E226	484-1.0	GT2W1		TC-10	" " ‡
C36	5000		23E2025	1467-005	1D5D5	811-005	29C1	2nd V. IF Decoupling
C37	5000		23E2025	1467-005	1D5D5	811-005	29C1	2nd V. IF Fil. Bypass
C38	100		23E11	1468-0001	5W5T1	GP1K-100	1FM-31	IF Coupling
C39	5000		23E2025	1467-005	1D5D5	811-005	29C1	3rd V. IF Cath. Bypass
C40	5000		23E2025	1467-005	1D5D5	811-005	29C1	3rd V. IF Fil. Bypass
C41	5000		23E2025	1467-005	1D5D5	811-005	29C1	3rd V. IF Decoupling
C42	100		23E11	1468-0001	5W5T1	GP1K-100	1FM-31	IF Coupling
C43	5		23E28	1468-000005	5W5V5	NPOK-5	MS-55	V. Diode Filter
C44	5		23E28	1468-000005	5W5V5	NPOK-5	MS-55	V. Diode Filter
C45	.1	200	23E2014-9	P288-1	GT2P1		TM-1	Video Coupling
C46	.02	400	23E413	P488-02	GT4S2		TM-12	V. Amp. Screen Bypass
C47	.2	400	23E2014-22	P488-22	GT4P2		TC-2	Video Coupling
C48	5000		23E2025	1467-005	1D5D5	811-005	29C1	Pic. Tube Cath. Dec.
C49	.1	400	23E2014-23	P488-1	GT4P1		TM-1	Video Coupling
C50	2		23E21					S. IF Coupling
C51	8		23E13			NPOK-3		Fixed Trimmer
C52	5000		23E2025	1467-005	1D5D5	811-005	29C1	S. IF Cath. Bypass
C53	5000		23E2025	1467-005	1D5D5	811-005	29C1	S. IF Decoupling
C54	1000			1468-001	1W5D1	GP2L-001	1FM-21	Diode Load Cap.
C55	.02	400	23E405	P688-002	GT6D2	GP2M-002	TM-22	De-emphasis
C56	.005	400	23E408	P688-005	GT6D5	GP2M-005	TM-25	Audio Coupling
C57	.005	400	23E408	P688-005	GT6D5	GP2M-005	TM-25	" "
C58	100		23E11	1468-0001	5W5T1	GP1K-100	1FM-31	AF Plate Bypass
C59	.25	200	23E222	P488-25	GT2P25		TC-2	AF Plate Decoupling
C60	.01	400	23E411	P488-01	GT2S1	GP2-335-01	TM-11	Audio Coupling
C61	.02	400	23E413	P488-02	GT4S2		TM-12	Output Plate Bypass
C62	.05	400	23E216	P488-05	GT4S5		TM-15	Sync. Coupling
C63	.01	220 VAC	23E250	P688-01	GT6S1		TM-11	Line Filter
C64	.01	220 VAC	23E250	P688-01	GT6S1		TM-11	" "

CAPACITORS (CONT.)

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: SENTINEL PART No.	REPLACEMENT DATA: AEROVOX PART No.	REPLACEMENT DATA: CORNELL-DUBILIER PART No.	REPLACEMENT DATA: ERIE PART No.	REPLACEMENT DATA: SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C65	500	500	23E45	1468-0005	5W5T5	GP2K-500	1FM-35	Integrator Net.
C66	500	500	23E45	1468-0005	5W5T5	GP2K-500	1FM-35	" "
C67	.01	400	23E211	P488-01	GT4S1	GP2-335-01	TM-11	" "
C68	.02	400	23E2014-19	P488-02	GT4S2		TM-12	Vert. MV Feedback
C69	.1	400	23E2014-9	P488-1	GT4P1		TM-1	Vert. Discharge
C70	.2	400	23E421	P488-22	GT4P2		TC-2	Vert. Sweep Coupling
C71	.03	400		P488-03	GT4S3		TM-13	Linearity Comp.
C72	.1	600	23E618	P688-1	GT6P1		TM-1	Vert. Sweep Coupling
C73	.005	6000	23E2026-3	7584-005	D8TH-60D6	TVM-256		" " "
C74	.005	6000	23E2026-3	7584-005	D8TH-60D6	TVM-256		" " "
C75	200	500	23E41	1468-0002	5W5T2	GP2K-200	1FM-32	Hor. Sync. Coupling †
C76	100		23E11	1468-0001	5W5T1	GP1K-100	1FM-31	Hor. MV Feedback
C77	1000	500	23E50-10	1468-001	1W5D1	GP2L-001	1FM-21	Hor. Discharge
C78	.01	1200	23E1211	P1688-01	GT16S1		MB-11	Hor. Sweep Coupling
C79	.01	1200	23E1211	P1688-01	GT16S1		MB-11	" " "
C80	.001	6000	23E2026-2	7584-001	D8TH-60D1	TVM-216		" " "
C81	.001	6000	23E2026-2	7584-001	D8TH-60D1	TVM-256		" " "
C82	.05	200	23E216	P288-05	GT2S5	TM-15		Hor. Output Cath. Bypass
C83	.1	400	23E418	P488-1	GT4P1	TM-1		Decoupling
C84	1000	500	23E50-10	1468-001	1W5D1	GP2L-001	1FM-21	Fixed Trimmer
C85	.1	400	23E418	P488-1	GT4P1	TM-1		HV Osc. Screen Bypass
C86	72		23E28	1468-000075	5W5Z7	N750L-75	1FM-475	Fixed Trimmer
C87	.01	1200	23E1211	P1688-01	GT16S1		MB-11	Mod. HV Filter
C88	.01	1200	23E1211	P1688-01	GT16S1		MB-11	" " "
C89A	350		*					HV Filter
B	350							" "
C90	.01	1200	23E1211	P1688-01	GT16S1		MB-11	Filament Bypass

* Items C89A, C89B, and R93 are combined into one unit, obtainable under MFGR'S Part No. 23E2022-3.

† Some models use 5000MMF in this application.

‡ Some models use .25MFD in this application.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: SENTINEL PART No.	REPLACEMENT DATA: IRC PART No.	REPLACEMENT DATA: CLAROSTAT PART No.	INSTALLATION NOTES
R1	100Ω	2	28E31		58-1000	Contrast control (Wire Wound)
R2A	25KΩ	‡	28E32	Q11-120	AM-40-8	Brightness control
B	Shaft	‡	Not Req.	Not Req.	KSS-3	Attach to R2A per instructions
R3A	500KΩ	‡	28E33	Q13-133	AM-60-Z	Volume control
B	Shaft	‡	Not Req.	Not Req.	KSS-3	Attach to R3A per instructions
C	Switch		Not Req.	76-1	SW-A	Attach to R3A per instructions
R4	250KΩ	‡	28E45	Q11-130	15/16-55-S	Horiz. hold control
R5	1 Meg.	‡	28E36	Q11-137	15/16-61-S	Horiz. size control
R6	1 Meg.	‡	28E36	Q11-137	15/16-61-S	Vert. hold control
R7	500KΩ	‡	28E37	Q11-133	15/16-58-S	Vert. size control
R8	5 Meg.	‡	28E34	Q11-141 & C-3 #		Focus control
R9	5 Meg.	‡	28E34	Q11-141 & C-3 #		Vert. centering control
R10	5 Meg.	‡	28E34	Q11-141 & C-3 #		Horiz. centering control
R11	500KΩ	‡	28E37	Q11-133	M-58-S	Vert. linearity control

Use an extra nut as a spacer to hold control back from control sub-panel as far as possible. Then saw off shaft of new control so that C-3 coupler can be employed to connect part of original shaft, (insulated shaft) to the new control. (CAUTION; Be sure that C-3 coupler has plenty of clearance between itself and chassis.)

RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: SENTINEL PART No.	REPLACEMENT DATA: IRC PART No.	IDENTIFICATION CODES ALL RESISTORS ARE ±10% UNLESS OTHERWISE STATED
R12	22KΩ 20%	‡			RF Grid
R13	56KΩ 20%	‡			RF Screen
R14	10KΩ	1			RF Plate
R15	100Ω	‡			RF Cathode
R16	470Ω	‡			Mixer Coil Shunt
R17	1 Meg.	‡			Mixer Grid
R18	82KΩ	‡			Mixer Screen
R19	680Ω	‡			Osc. Plate
R20	10KΩ 20%	‡			Osc. Grid
R21	100Ω	‡	27E102	BTS-1000	Mixer Plate Decoupling
R22	470KΩ 20%	‡	27E474	BTS-470K	Bias Network
R23	470KΩ 20%	‡	27E474	BTS-470K	" "
R24	330Ω	‡	27E332		1st Video IF Grid
R25	100Ω	‡	27E101		1st Video IF Cathode
R26	100Ω	‡	27E102	BTS-1000	1st Video IF Decoupling
R27	10KΩ	‡	27E103	BTS-10K	Bias Network
R28	470Ω 20%	‡	27E472	BTS-4700	2nd Video IF Grid
R29	47Ω	‡	27E470		2nd Video IF Cathode
R30	100Ω	‡	27E102	BTS-1000	2nd Video IF Decoupling
R31	270Ω	‡	27E272		3rd Video IF Grid
R32	100Ω	‡	27E101		3rd Video IF Cathode
R33	100Ω	‡	27E102	BTS-1000	3rd Video IF Decoupling
R34	8200Ω	‡	27E822	BTS-8200	Video Det. Diode Load
R35	470KΩ 20%	‡	27E474	BTS-470K	Bias Network
R36	1 Meg. 20%	‡	27E105	BTS-1 Meg.	Video Amp. Grid
R37	68Ω	‡	27E680		Video Amp. Cathode
R38	6800Ω	1	27E682-3	BTA-6800	Video Amp. Plate
R39	6800Ω	2	27E682-5	BT-2-6800	Video Amp. Screen
R40	15KΩ	2	27E153-5	BT-2-15K	Bleeder
R41	180Ω	‡	27E181		Sound IF Cathode See Note 5
R42	1000Ω	‡	27E102	BTS-1000	Sound IF Decoupling
R43	6800Ω	‡	27E682	BTS-6800	Ratio Det. Diode Load
R44	6800Ω	‡	27E682	BTS-6800	" " "
R45	39KΩ	‡	27E393	BTS-39K	De-emphasis
R46	10Meg. 20%	‡	27E106	BTS-10 Meg.	AF Grid
R47	220KΩ 20%	‡	27E224	BTS-220K	AF Plate
R48	220KΩ 20%	‡	27E224	BTS-220K	" "

RESISTORS (CONT.)

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: SENTINEL PART No.	REPLACEMENT DATA: IRC PART No.	IDENTIFICATION CODES
R49	470KΩ 20%	‡	27E474	BTS-470K	Output Grid
R50	180Ω	‡	27E181-2	BW-½-180	Output Cathode
R51A	400Ω	5	27E100-6	AB-400	Filter (Wire Wound)
B	120Ω	5		AB-125	Filter (Wire Wound)
R52	33Ω	1	27E330-3		Surge Limiter
R53	1 Meg. 20%	‡	27E105	BTS-1 Meg.	Sync. Sep. Grid
R54	270Ω	‡	27E271	BW-½-270	Sync. Sep. Cathode See Note 7
R55	22KΩ	‡	27E223	BTS-22K	" " " "
R56	220KΩ	‡	27E224	BTS-220K	Sync. Sep. Plate
R57	100KΩ	‡	27E104	BTS-100K	Phase Correction
R58	10KΩ	‡	27E103	BTS-10K	Voltage Divider See Note 1
R59	47KΩ	‡	27E473	BTS-47K	Integrator
R60	47KΩ	‡	27E473	BTS-47K	"
R61	68KΩ	‡	27E683	BTS-68K	"
R62	22KΩ	‡	27E223	BTS-22K	Vert. Osc. Grid
R63	47KΩ	‡	27E471	BTS-470	Vert. Osc. Cathode
R64	47KΩ	1	27E473-3	BTA-47K	Vert. Osc. Plate
R65	470KΩ	‡	27E474	BTS-470K	Vert. Osc. Grid
R66	470KΩ	‡	27E474	BTS-470K	Vert. Osc. Plate
R67	22KΩ	‡	27E223	BTS-22K	Voltage Divider
R68	270KΩ	‡	27E274	BTS-270K	" "
R69	1 Meg.	‡	27E105	BTS-1 Meg.	" "
R70	22KΩ	‡	27E223	BTS-22K	Vert. Amp. Cathode
R71	4.7 Meg.	‡	27E1017	BTA-4.7 Meg.	Vert. Amp. Plate
R72	100KΩ	‡	27E104	BTS-100K.	Vert. Amp. Grid
R73	6 Meg.	‡	27E1009-4		Voltage Divider
R74	4.7 Meg.	1	27E1017	BTA-4.7 Meg.	Vert. Amp. Plate
R75	820Ω	‡	27E821	BTS-820	Voltage Divider See Note 2
R76	470KΩ	‡	27E472	BTS-4700	Horiz. Osc. Grid See Note 3
R77	100Ω	‡	27E102	BTS-1000	Horiz. Osc. Cathode
R78	100KΩ 20%	‡	27E104	BTS-100K	Horiz. Osc. Plate
R79	220KΩ 20%	‡	27E224	BTS-220K	Horiz. Osc. Grid
R80	1 Meg.	2	27E105-5	BT-2-1 Meg.	Horiz. Osc. Plate See Note 4
R81	680KΩ	‡	27E684	BTS-680K	Voltage Divider
R82	33KΩ	‡	27E333	BTS-33K	"
R83	470KΩ	‡	27E474	BTS-470K	Horiz. Amp. Grid
R84	2200Ω 20%	‡	27E222	BTS-2200	Horiz. Amp. Cathode
R85	470KΩ 20%	‡	27E474	BTS-470K	Horiz. Amp. Grid
R86	100KΩ	2	27E104-5	BT-2-100K	Horiz. Amp. Plate
R87	8200Ω	‡	27E822	BTS-8200	" " "
R88	100KΩ	2	27E104-5	BT-2-100K	Horiz. Amp. Plate
R89	82KΩ	‡	27E823	BTS-82K	HV Osc. Grid
R90	33KΩ	1	27E333-3	BTA-33K	HV Osc. Screen
R91	47Ω	‡	27E470	BW-½-47	Filter
R92	33Ω	‡	27E330		Parasitic Supp.
R93	100KΩ	‡	*		HV Filter
R94	2.2Meg. 20%	‡	27E225-2	BTS-2.2 Meg.	Filament Isolation
R95	4.7Meg. 20%	‡	27E475	BTS-4.7 Meg.	Vert. Deflection Load
R96	3.9Meg. 20%	‡	27E395-2	BTS-3.9 Meg.	Horiz. Deflection Load
R97	4.7Meg. 20%	‡	27E475	BTS-4.7 Meg.	Vert. Deflection Load
R98	3.9Meg. 20%	‡	27E395-2	BTS-3.9 Meg.	Horiz. Deflection Load
R99	2.2Meg. 20%	‡	27E225-2	BTS-2.2 Meg.	Voltage Divider
R100	2.2Meg. 20%	‡	27E225-2	BTS-2.2 Meg.	" "
R101	2.2Meg. 20%	‡	27E225-2	BTS-2.2 Meg.	" "
R102	2.2Meg. 20%	‡	27E225-2	BTS-2.2 Meg.	" "
R103	2.2Meg. 20%	‡	27E225-2	BTS-2.2 Meg.	Voltage Divider See Note 7
R104	2.2Meg. 20%	‡	27E225-2	BTS-2.2 Meg.	" " " " "
R105	4.7Meg. 20%	2	27E1017		Voltage Divider See Note 6
R106	4.7 Meg.	2	27E1017		" " " " "
R107	470KΩ	‡	27E474-2	BTS-470K	" "
R108	390Ω	2	27E1015	BW-2-390	Filter (Wire Wound)
R109	10Ω	2	27E1014		Surge Limiter
R110	150KΩ	‡	27E154	BTS-150K	Picture Tube Grid
R111	10KΩ	‡	27E103	BTS-10K	Voltage Divider See Note 8
R112	15KΩ	‡	27E153	BTS-15K	" " " See Note 7

* Items C89A, C89B and R93 are combined into one unit, obtainable under MFGR'S Part No. 23E2022-3.

Note 1. Some models use 4700Ω resistor in this application.
Note 2. Some models use one 470Ω resistor in this application, or two 470Ω resistors in series to obtain correct resistance and wattage.
Note 3. Some models use 12KΩ resistor in this application.
Note 4. Some models use three 330KΩ resistors in series to obtain correct resistance and wattage.
Note 5. Some models use 68Ω resistor in this application.
Note 6. Some models use two 2.4 Meg resistors in series to obtain correct resistance and wattage.
Note 7. Not used in all models.
Note 8. Some models use 8200Ω resistor in this application.

TRANSFORMER (POWER)

ITEM No.	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: SENTINEL PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.
T1	117VAC @ 1.18 A	120VAC .20ADC SEC. 4 6.3VAC 4.1A	6.3VAC @ .6A	6.3VAC @ 4.4A	22E27	P-8158		

TRANSFORMER (H.V. OSC.)

ITEM No.	RATING: DC RESISTANCE PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: SENTINEL PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.	NOTES
T2	1.72	590Ω			20E370				
		SEC. 2 0Ω							
		SEC. 3 102Ω							

SENTINEL MODELS 400-TV, 405-TVM

PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA				INSTALLATION NOTES
	IMPEDANCE		DC RES.		SENTINEL PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
	PRI.	SEC.	PRI.	SEC.					
T3	3800Ω	3.5Ω	250Ω	.4Ω	22E28	A-3877	A-2930	RO-9 ‡	‡ Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA			NOTES
	FIELD RES.	V. C. IMP.	SENTINEL PART No.	JENSEN PART No.	QUAM PART No.	
SP1	PM	3.5Ω	1E31	ST-107 MOD.P5-V	5A15	
	CONE DIA.	V. C. DIA.				
SP2	4 3/4"	9/16"				

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA				INSTALLATION NOTES
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (0 CURRENT 1000 ∿)	SENTINEL PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
L1	.143A	136Ω	3.2Henries	22E36	C-2304 ‡	C-2974	TR-4200‡	‡ Drill one new mounting hole.

COILS (RF-IF)

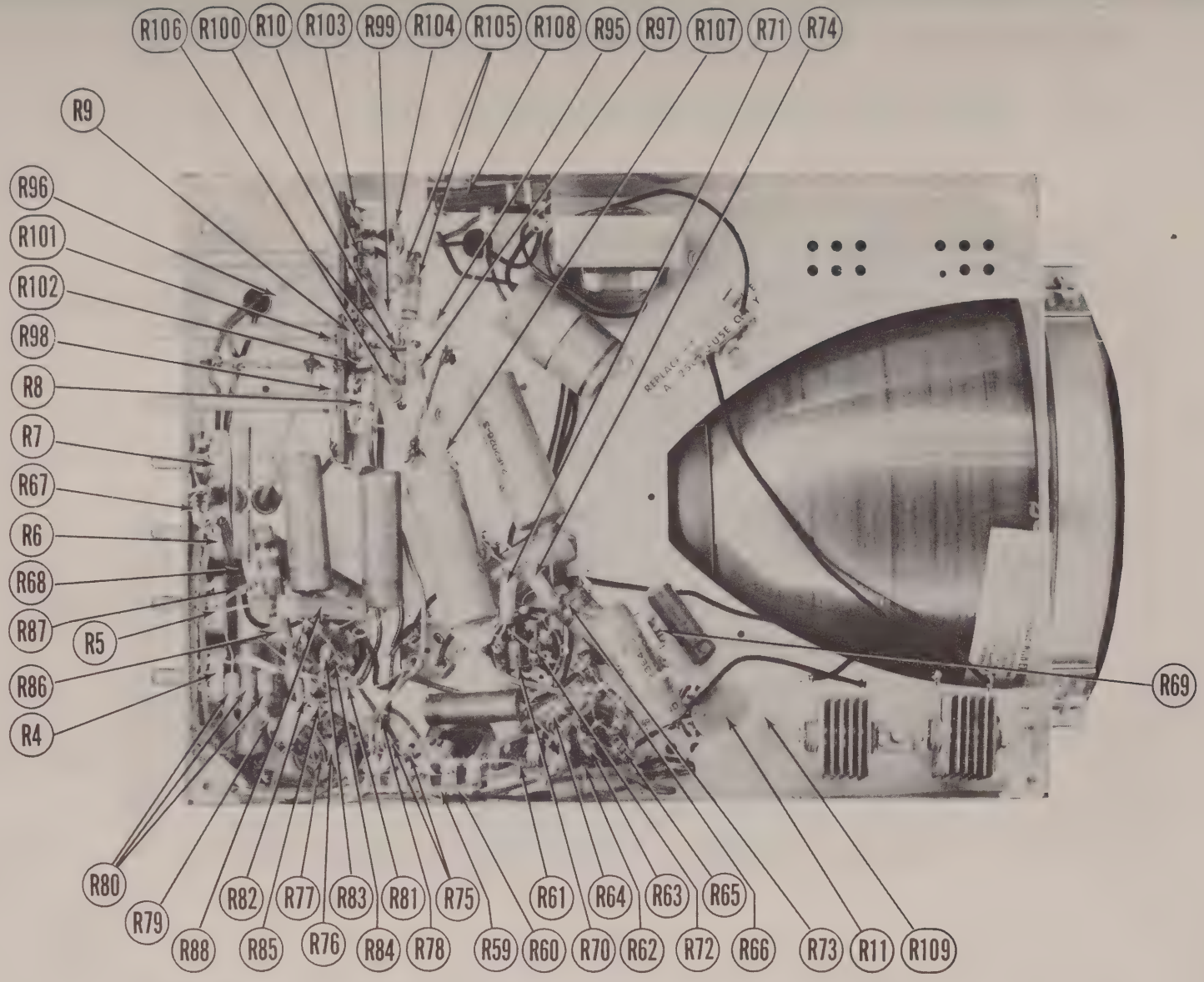
ITEM No.	USE	DC RES.		REPLACEMENT DATA		NOTES
		PRI.	SEC.	SENTINEL PART No.	MEISSNER PART No.	
L2	Ant. Loading Coil	0Ω				Channels 7-13, part of tuner.
L3	Ant. Loading Coil	0Ω				Channels 7-13, part of tuner.
L4	RF Choke	0Ω				Part of tuner.
L5	1st Video IF	.1Ω		20E360		
L6	2nd Video IF	.1Ω		20E360		
L7	3rd Video IF	.1Ω		20E360		
L8	4th Video IF	2.1Ω		2E79		Wound on 15KΩ resistor.
L9	5th Video IF	.1Ω		20E360		
L10	Peaking	9Ω		20E363-2		Wound on 33KΩ resistor.
L11	Peaking	19.5Ω		20E363-4		Wound on 8.2KΩ resistor.
L12	Peaking	13.5Ω		20E363-3		Wound on 15KΩ resistor.
L13	Peaking	18Ω		20E363-5		Wound on 10 Meg. resistor.
L14	Fil. Choke	.1Ω		2E78		
L15	Fil. Choke	.1Ω		2E78		
L16	Fil. Choke	.1Ω		2E78		
L17	Fil. Choke	.1Ω		2E78		
L18	1st Sound IF	3Ω		20E361		
L19	Ratio Det. Trans.	3.8Ω	.4Ω	20E362		
L20	RF Choke	110Ω		2E75		Part of tuner
L21	Ant. Loading	0Ω				

SELENIUM RECTIFIER

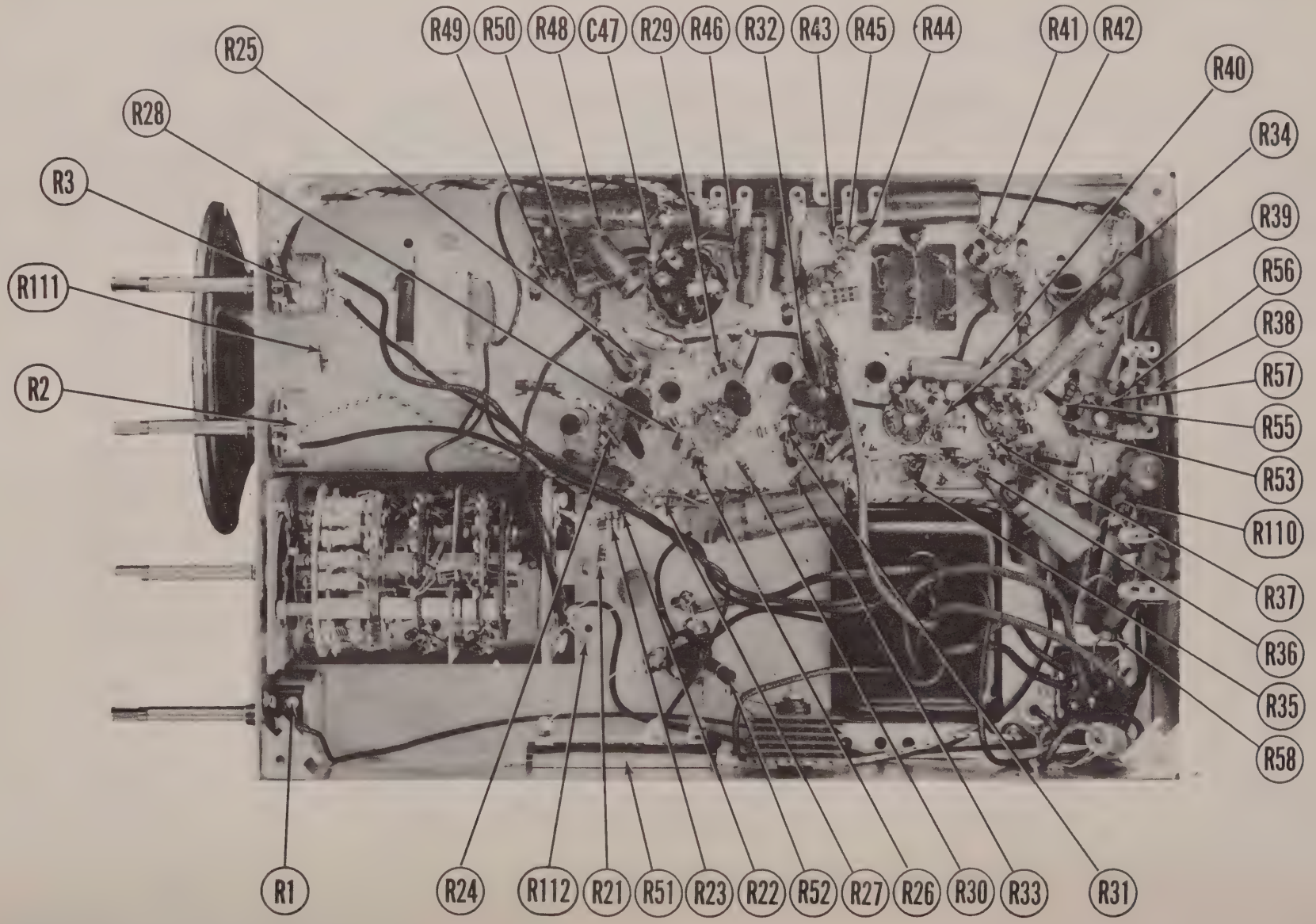
ITEM No.	RATING	REPLACEMENT DATA			NOTES
	CURRENT	SENTINEL PART No.			
M1	.069A	57E3			
M2	.143A	57E3			
M3	.143A	57E3			

MISCELLANEOUS

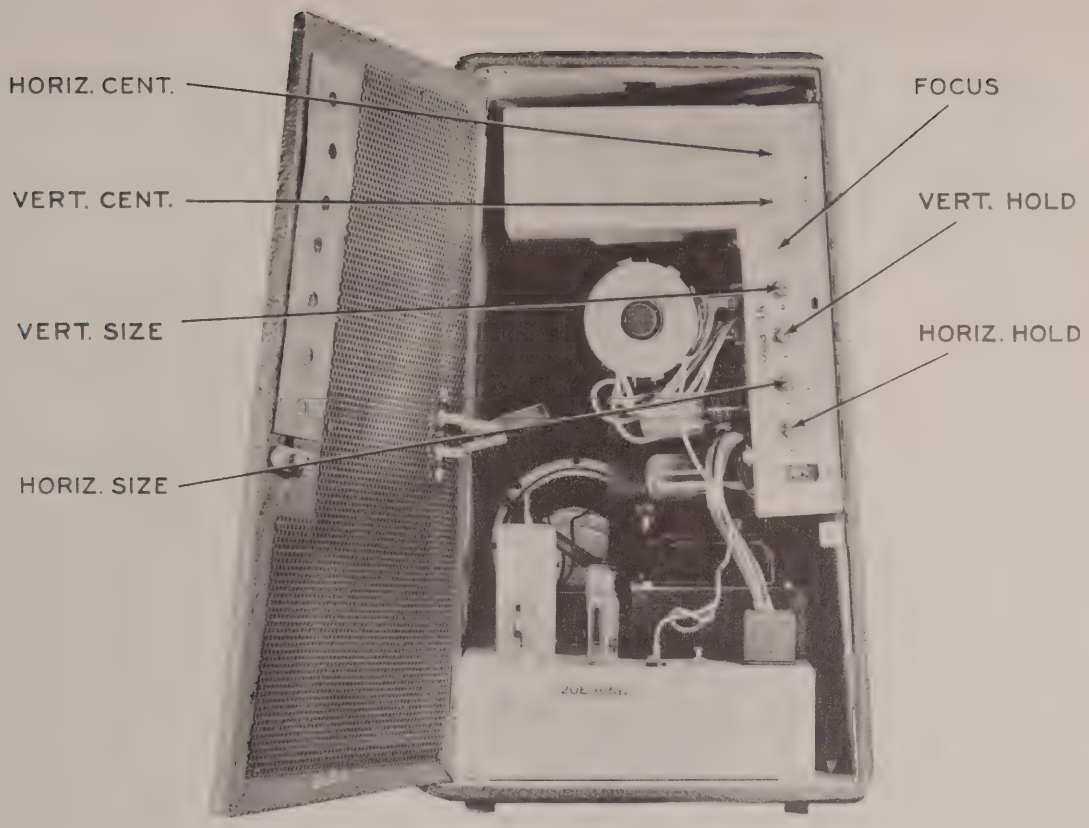
ITEM No.	PART NAME	SENTINEL PART No.	NOTES
M4	RF Tuner	20E364	Includes tuner unit, channel switch and multiple resistor-capacitor combination.
M5	Portable Antenna	64E24	
M6	Fuse		Type AGC .25A
	Cabinet	7E184	Wood table model less front plate.
	Cabinet Door	20E430	Wood table model.
	Cabinet	7E179	Portable model less front plate.
	Cabinet Door	20E449	Portable model rear door with hinges, antenna posts and line cord.
	Cabinet Escutcheon	5E40	Metal front plate.
	Knob	20E427	With pointer.
	Knob	37E54	
	Safety Glass	9E15	
	Socket	17E33	12 contact female.
	Plug	17E30	12 contact male.



SWEEP CHASSIS-BOTTOM VIEW-RESISTOR IDENTIFICATION



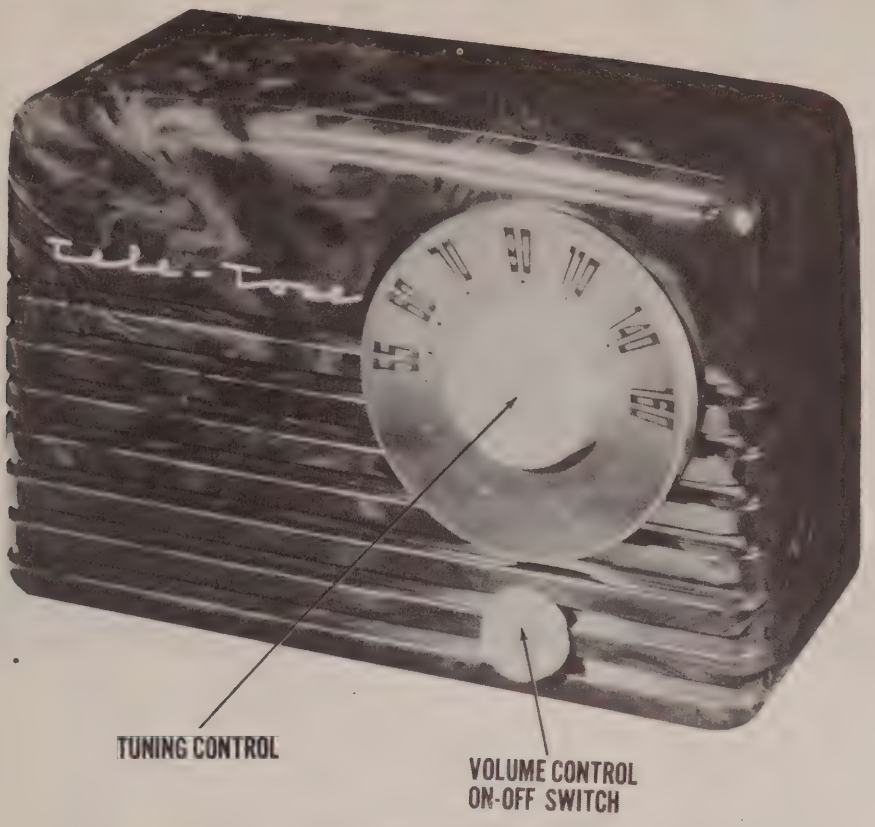
RF-IF CHASSIS-BOTTOM VIEW-RESISTOR IDENTIFICATON



CABINET-REAR VIEW

TELE-TONE MODELS
205, 215 (Ch. SERIES BD)

TELE-TONE MODELS
205, 215 (Ch. SERIES BD)



TELE-TONE MODEL 205

TRADE NAME Tele-Tone, Models 205, 215 (Ch. Series BD)
MANUFACTURER Tele-Tone Radio Co., 540 W. 58th St., New York 19, N.Y.
TYPE SET AC-DC Operated Superheterodyne Receiver with Loop Antenna.
TUBES (FIVE) Types 12BE6 Converter, 12BA6 IF Amp., 12SQ7GT DET-AVC-AF, 50L6GT Power Output, 35Z5GT Rectifier.

POWER SUPPLY 110-120 Volts AC RATING .25 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST 535-1600KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use isolation transformer if available. If not connect a .1 MFD. cap. in series with low side of signal generator and B-.

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

To set pointer turn tuning cap. fully closed and set pointer parallel with base of dial.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.05MF	High side to stator of rear section of tuning gang. Low side to B-.	455KC (400~ Mod.)	Tuning gang fully closed.	Across voice coil.	A1, A2 A3, A4	Adjust for maximum output. If isolation transformer is not used reduce dummy antenna to .001 MFD to reduce hum modulation.
2.	.05MF	"	1600KC (400~ Mod.)	Tuning gang fully open.	"	A5	"
3.		Loop	1400KC (400~ Mod.)	Tune for maximum output.	"	A6	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
4.		Loop	535KC (400~ Mod.)	Tuning gang fully closed.	"		Bend end rotor plates at oscillator (rear) section of tuning gang for max. output. Repeat steps 3 and 4 for optimum results.

HOWARD W. SAMS & CO., INC. • Indianapolis Indiana

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DATE 10/49 SET #73 FOLDER #12

PARTS LIST AND DESCRIPTIONS

TELE-TONE
MODEL 205

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: TELE-TONE PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	Converter	12BE6	12BE6	7CH	
V2	IF Amp.	12BA6	12BA6	7BK	
V3	DET-AVC-AF Amp.	12SQ7GT	12SQ7GT	8Q	
V4	Power Output	50L6GT	50L6GT	7AC	
V5	Rectifier	35Z5GT	35Z5GT	6AD	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: TELE-TONE PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	50	150	CE-20	PRSA150/50	EDL5315		TA-530	Filter-Green
B	30	150		-30				Filter-Red
C2	.05	200	CP-503-4	P288-05	GT2S5		TM-15	AVC Filter
C3	.1	400	CP-104-2	P488-1	GT4P1		72P52	Line Isolation
C4	100	500	CM-101-1	1468-0001	5W5T1	GP1K-100	1FM-31	Diode RF Filter
C5	100	500	CM-101-1	1468-0001	5W5T1	GP1K-100	1FM-31	RF Bypass
C6	.002	400	CP-202-2	P688-002	GT6D2	GP2M-002	TM-22	Audio Coupling
C7	.005	400	CP-502-2	P688-005	GT6D5	GP2M-005	TM-25	Audio Coupling
C8	.02	400	CP-203-1	P488-02	GT4S2		TM-12	Output Plate Bypass
C9	.02	400	CP-203-1	P488-02	GT4S2		TM-12	Rectifier Bypass

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: TELE-TONE PART No.	IRC PART No.	CLAROSTAT PART No.	INSTALLATION NOTES
R1A	2 Meg.	½	VC-11	Q13-139*	M-66-Z*	Volume control
B	Switch		Not Req.	76-1	SW-A	Attach to R1A per instructions

* Install 100KΩ Resistor In Series With The Right Hand Terminal Of The New Control And The Lead Connecting To The Same Terminal Of The Original Control. (Controls Viewed From Shaft Side, Terminals Down.)

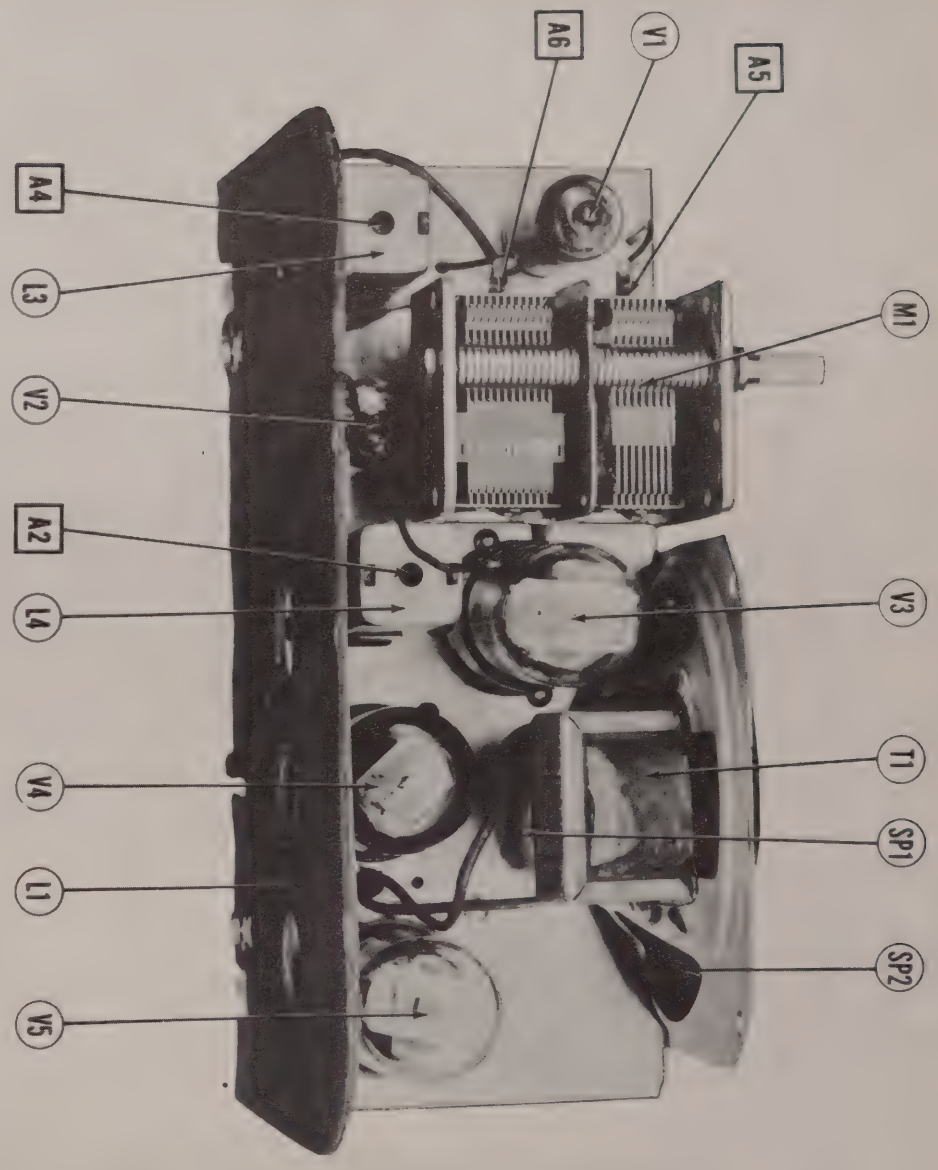
RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: TELE-TONE PART No.	IRC PART No.	IDENTIFICATION CODES
R2	22KΩ	½	RC-223-2	BTS-22K	Osc. Grid
R3	270Ω	½	RC-271-2	BW-½-270	IF Cathode
R4	3.3 Meg.	½	RC-335-1	BTS-3.3 Meg	AVC Network
R5	10 Meg.	½	RC-106-1	BTS-10 Meg.	AF Grid
R6	270KΩ	½	RC-274-1	BTS-270K	AF Plate
R7	470KΩ	½	RC-474-1	BTS-470K	Output Grid
R8	150Ω	½	RC-151-1	BW-½-150	Output Cathode
R9	2200Ω	1	RC-222-5	BW-1-2200	Filter
R10	18Ω	½	RC-180-1		Rectifier Ballast

TRANSFORMER (OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	RATING: IMPEDANCE SEC.	RATING: DC RES. PRI.	RATING: DC RES. SEC.	REPLACEMENT DATA: TELE-TONE PART No.	STANCOR PART No.	CHICAGO PART No.	MERIT PART No.	INSTALLATION NOTES
T1	3000Ω	3.5Ω	265Ω	.6Ω	TR-10B	A-3332	RO-1A	A-3025	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA: TELE-TONE PART No.	JENSEN PART No.	QUAM PART No.	INSTALLATION NOTES
	FIELD	V.C. IMP.		ST-113†		
SP1	PM	3.5Ω	SP-40-10B	MOD.P4-X	4A07†	† Remount Output Transformer
	CONE DIA.	V.C. DIA.				
SP2	3 7/8"	9/16"				

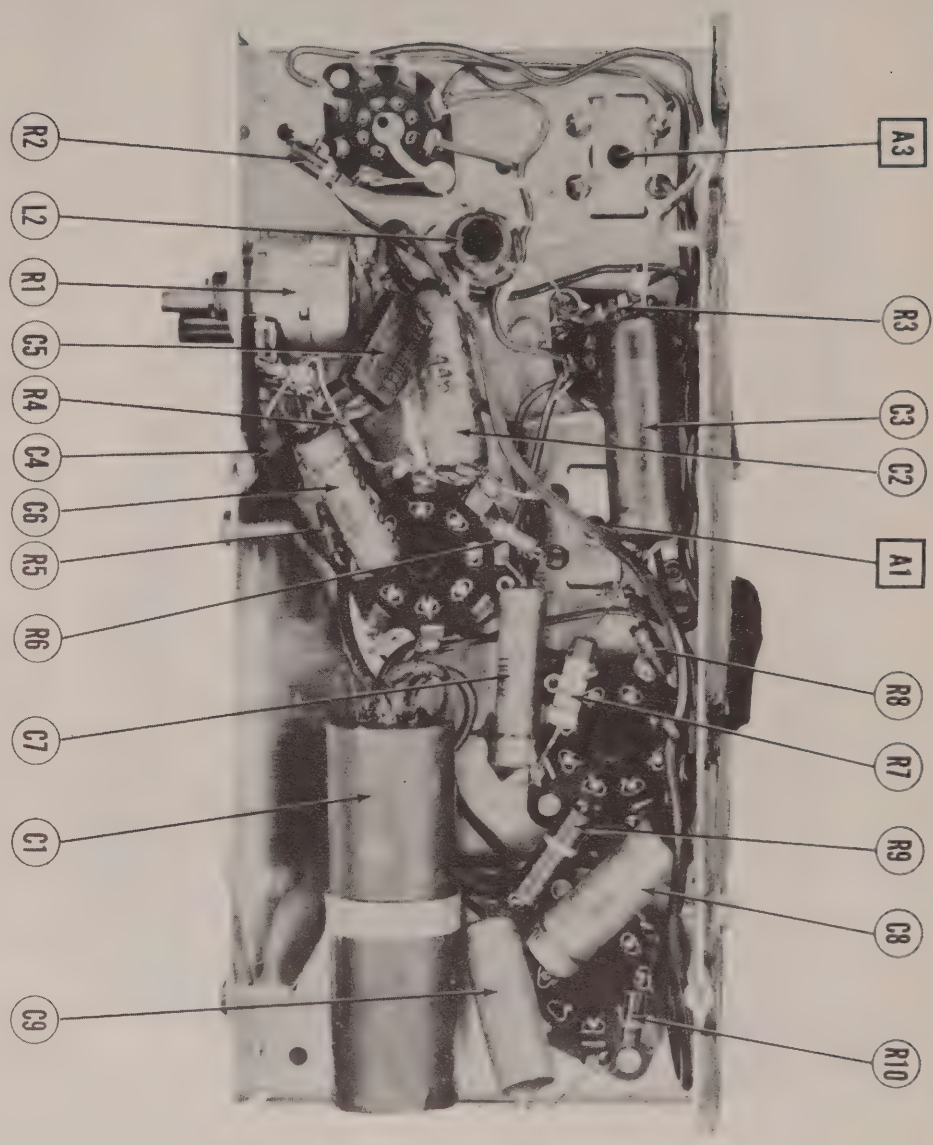
R F COILS

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: TELE-TONE PART No.	REPLACEMENT DATA: MEISSNER PART No.
L1	Loop Ant.		4Ω	LP-16	
L2	Osc.Coil	.8Ω	6Ω	LC-9	14-1060
L3	Input IF	23Ω	23Ω	LF-29	16-6678
L4	Output IF	23Ω	23Ω	LF-29	16-6678

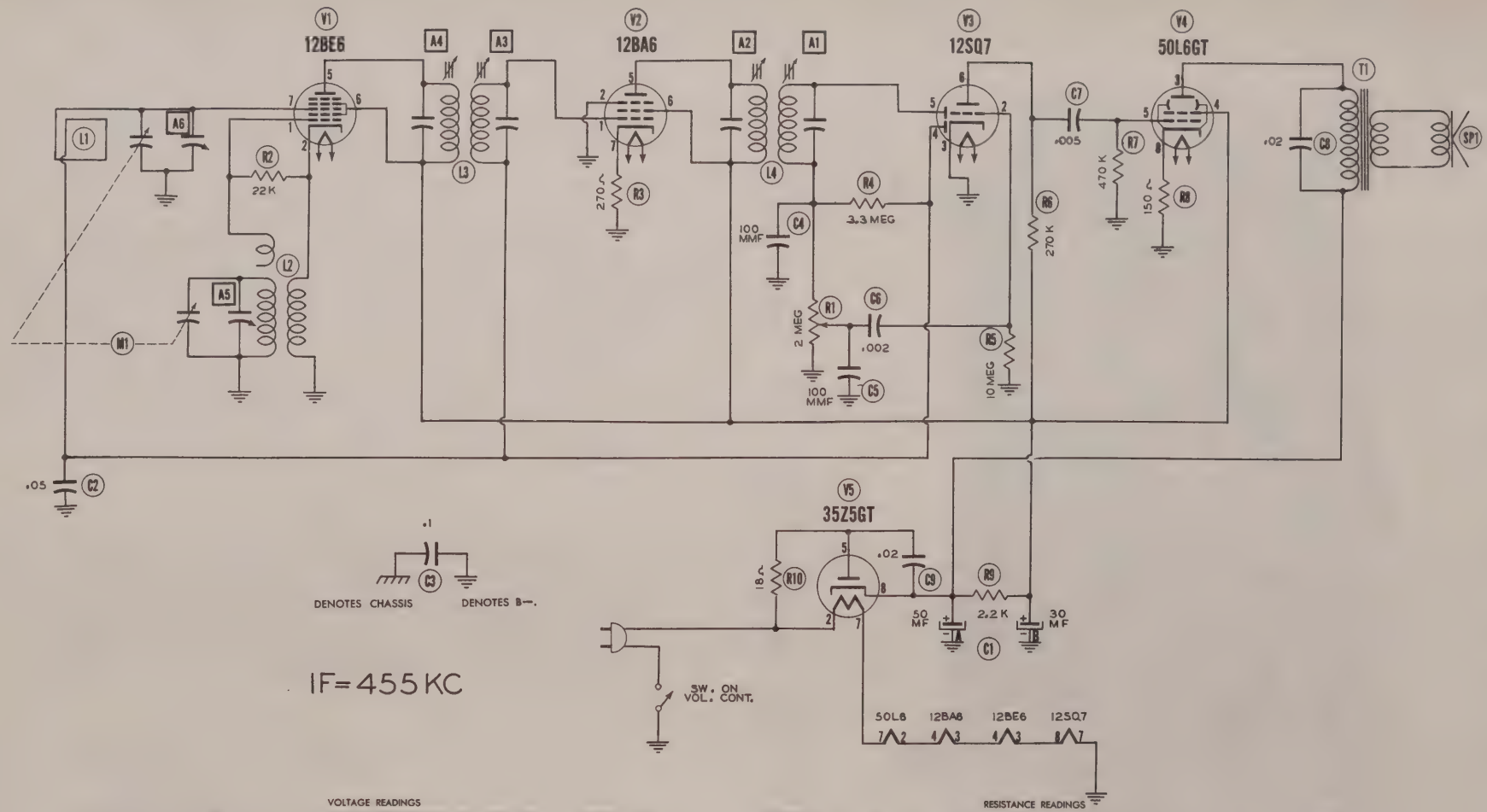
MISCELLANEOUS

ITEM No.	PART NAME	TELE-TONE PART No.	NOTES
M1	2 Gang Var. Cap	CV-19	(21-385MMF, 25-365MMF)
	Cabinet	CB-106A	Model 205
	Knob	KN-20-2	Ivory
	Knob	KN-21-2	Ivory (Pointer)

CHASSIS—BOTTOM VIEW



TELE-TONE MODEL 205



VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	12BE6	§-6.3 VDC	0V	12VAC	24VAC	90VDC	90VDC	-1VDC	
V 2	12BA6	-1.VDC	0V	24VAC	35VAC	90VDC	90VDC	2.0VDC	
V 3	12SQ7	0V	-1.5VDC	0V	-1VDC	-1.3VDC	55VDC	0V	12VAC
V 4	50L6GT	0V	35VAC	120VDC	90VDC	0V	0V	75VAC	6.0VDC
V 5	35Z5GT	0V	117VAC	107VAC	0V	113VAC	0V	75VAC	125VDC

§ Taken With Vacuum Tube Voltmeter.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	12BE6	22KΩ	.5Ω	12Ω	24Ω	†2000Ω	†2000Ω	4 Meg.	
V 2	12BA6	4 Meg.	0Ω	24Ω	36Ω	†2000Ω	†2000Ω	270Ω	
V 3	12SQ7	Inf.	10 Meg.	0Ω	4 Meg.	1.3 Meg	†270KΩ	0Ω	12Ω
V 4	50L6GT	Inf.	36Ω	†200Ω	†2000Ω	470KΩ	Inf.	90Ω	150Ω
V 5	35Z5GT	Inf.	125Ω	120Ω	Inf.	140Ω	Inf.	90Ω	10KΩ

† Measured From Pin 8 Of V5.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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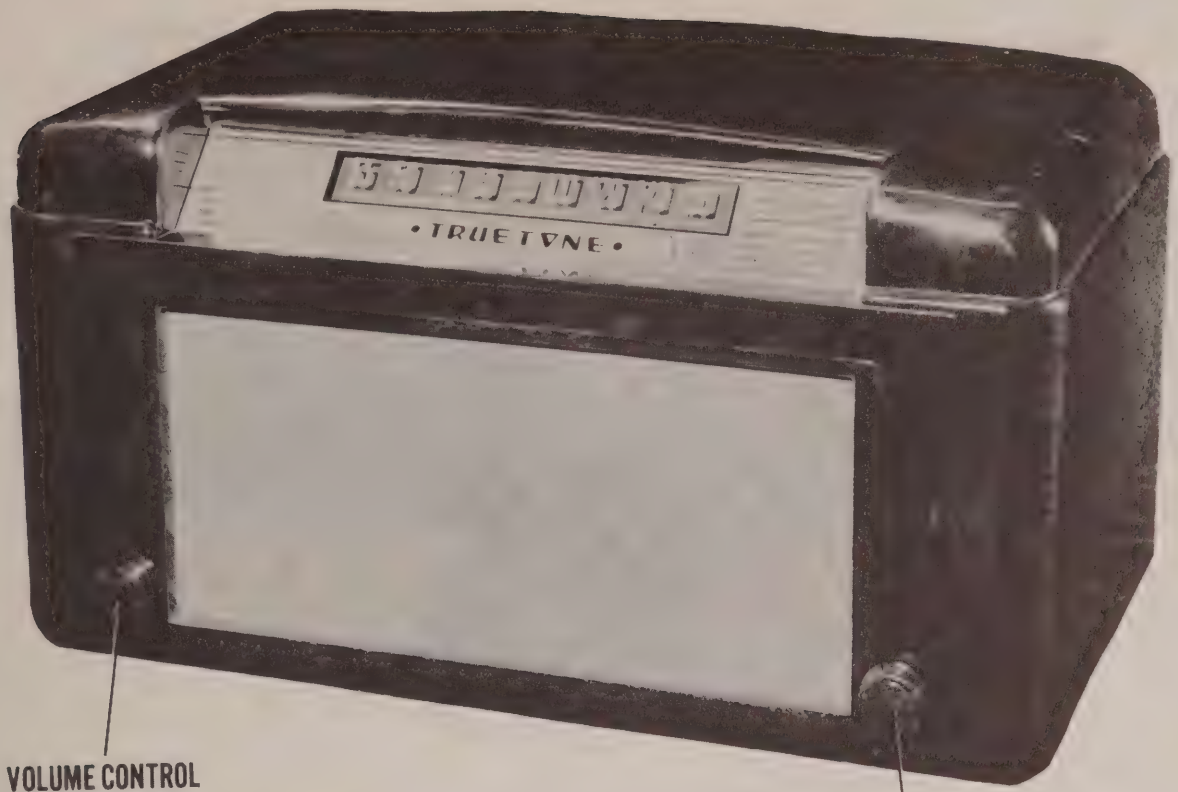
1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of + 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

TRUETONE MODEL D2963
BATTERY OPERATED



TRUETONE MODEL D2963
BATTERY OPERATED

TRUETONE MODEL D2963

TRADE NAME	Truetone, Model D2963
SUPPLIER	Western Auto Supply Co., 2107 Grand Ave., Kansas City, Mo.
TYPE SET	Battery Operated Superheterodyne Receiver
TUBES (FOUR)	Types 1R5 Converter, 1U4 IF Amp., 1U5 DET._AVC-AF, 3V4 Power Output
POWER SUPPLY RATING:	1.5 Volts "A" Supply and 90 Volts "B" Supply in Pack Form 225MA @ 1.5 Volts DC and 15MA @ 90 Volts DC
TUNING RANGE—BROADCAST	540-1620KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

To set pointer turn tuning cap fully closed and set pointer to last reference mark at low frequency end of dial.

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to rear stator of tuning gang. Low side to chassis.	455KC	1000KC	Across voice coil	A1,A2, A3,A4	Adjust for maximum output.
2.	200MMF	High side to ext antenna lead.Low side to chassis.	1500KC	1500KC	"	A5,A6	" " " "

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"The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed." "Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. Copyright 1949 by Howard W. Sams & Co., Inc., Indianapolis Indiana, U. S. of America. Copyright under International Copyright Union. All rights reserved under Inter-American Copyright Union (1910) by Howard W. Sams & Co., Inc." Printed in U. S. of America

DATE 10/49 SET #73 FOLDER 13

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: TRUETONE PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	Converter	1R5	1R5	7AT	
V2	IF Amp.	1U4	1U4	6AR	
V3	DET.-AVC-AF	1U5	1U5	6BW	
V4	Power Output	3V4	3V4	6BX	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: TRUETONE PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1	4	150	45A143	PRS150/4	BR415		UT-41	RF Bypass
C2	.05	200	46AU503J	P288-05	GT2S5		TM-15	AVC Filter
C3	100	500	CM20A101M	1468-0001	5W5T1	GP1K-100	1FM-31	Osc. Grid Cap.
C4	1000		47B20A102M3	1468-001	1W5D1	GP2L-001	1FM-21	Bias Filter
C5	.01	600	46AY103J	P688-01	GT6S1	GP2-335-01	TM-11	Osc. Anode Bypass
C6	1000		47B20A102M3	1468-001	1W5D1	GP2L-001	1FM-21	IF Grid Filter
C7	270	500	CM20A271M	1468-00025	5W5T25	GP2K-270	1FM-325	Diode RF Filter
C8	.006	600	46AZ602J	P688-006	GT6D6	GP2M-0056	TM-26	Audio Coupling
C9	.02	600	46AY203	P688-02	GT6S2		TM-12	AF Screen Bypass
C10	270	500	CM20A271M	1468-00025	5W5T25	GP2K-270	1FM-325	AF Plate Bypass
C11	.02	600	46AY203	P688-02	GT6S2		TM-12	RF Bypass
C12	.01	600	46AY103J	P688-01	GT6S1	GP2-335-01	TM-11	Audio Coupling
C13	.002	600	46AZ202J	P688-002	GT6D1	GP2M-002	TM-22	Output Plate Bypass

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: TRUETONE PART No.	IRC PART No.	CLAROSTAT PART No.	INSTALLATION NOTES
R1A	1 Meg.	½	25B806	Q13-137	AM-63-Z	Volume Control
B	Shaft		Not Req.	Not Req.	KSS-3	Attach to R1A Per Instructions
C	Switch		Not Req.	76-2	SW-A2	" " " " "

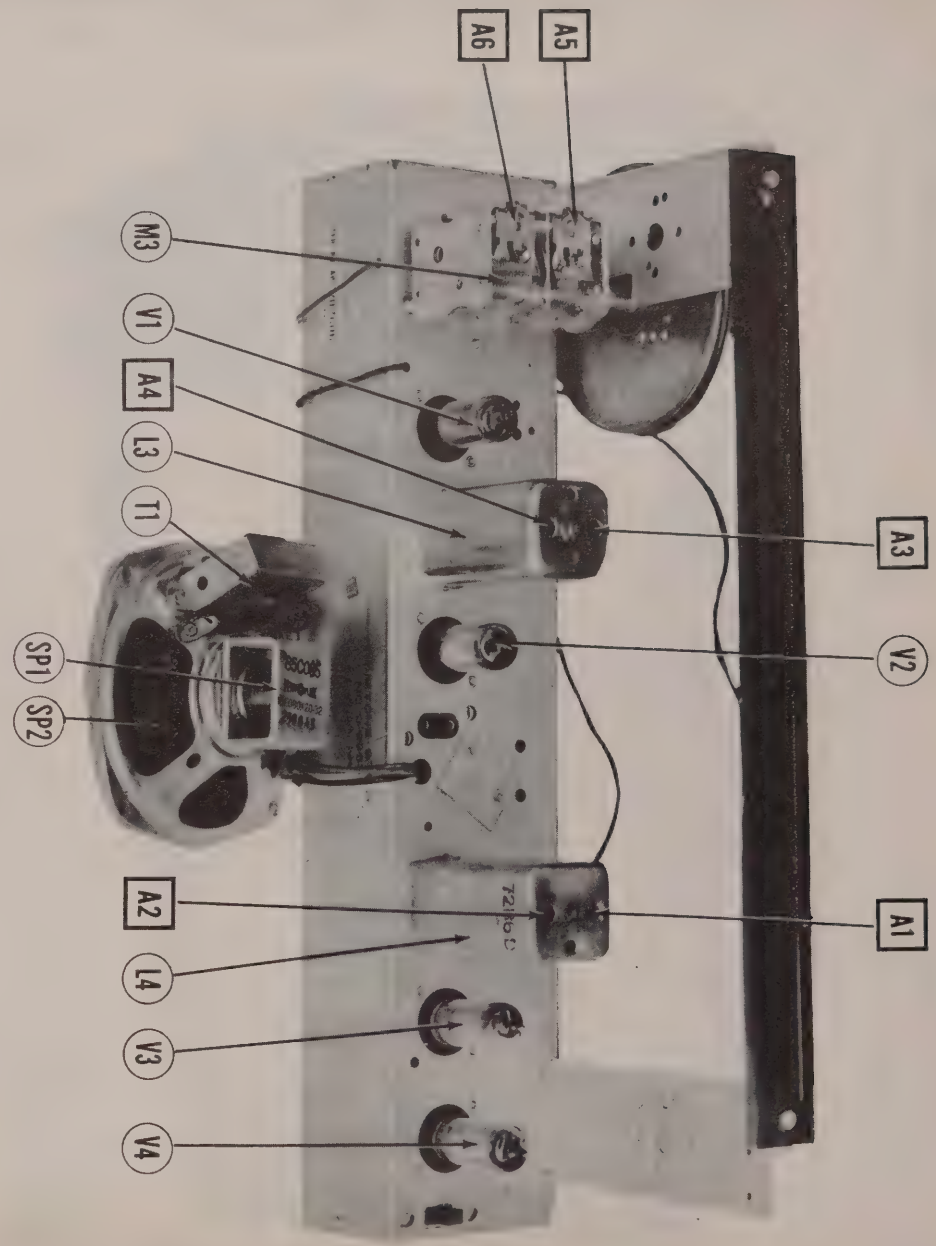
RESISTORS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: TRUETONE PART No.	IRC PART No.	IDENTIFICATION CODES
R2	68KΩ	½	RC20AE683K	BTS-68K	Osc. Grid
R3	33KΩ	½	RC20AE333K	BTS-33K	Osc. Grid
R4	6800Ω	½	RC20AE682M	BTS-6800	Osc. Plate Decoupling
R5	4.7 Meg.	½	RC20AE475K	BTS-4.7 Meg.	IF Grid
R6	2.2 Meg.	½	RC20AE225K	BTS-2.2 Meg.	AVC Network
R7	4.7 Meg.	½	RC20AE475K	BTS-4.7 Meg.	AF Grid
R8	1 Meg.	½	RC20AE105K	BTS-1 Meg.	AF Plate
R9	5.6 Meg.	½	RC20AE565M	BTS-5.6 Meg.	AF Screen
R10	2.2 Meg.	½	RC20AE225K	BTS-2.2 Meg.	Output Grid
R11	.75Ω	½	23A062	BW-½-.68	Filament String (Wire Wound)

TRANSFORMER (OUTPUT)

ITEM No.	RATING: IMPEDANCE PRI.	RATING: IMPEDANCE SEC.	RATING: DC RES. PRI.	RATING: DC RES. SEC.	REPLACEMENT DATA: TRUETONE PART No.	STANCOR PART No.	CHICAGO PART No.	MERIT PART No.	INSTALLATION NOTES
T1	8.5KΩ	3.3Ω	325Ω	.5Ω	Part of 85C085	A-3876	RO-2	A-2928	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA: TRUETONE PART No.	JENSEN PART No.	QUAM PART No.	INSTALLATION NOTES
	FIELD	V. C. IMP.				
SP1	PM	3.3Ω	85C085	ST-105 † MOD.P5-X	5A07†	† Remount output transformer.
	CONE DIA.	V. C. DIA.				
SP2	4 1/2"	9/16"				

R F COILS

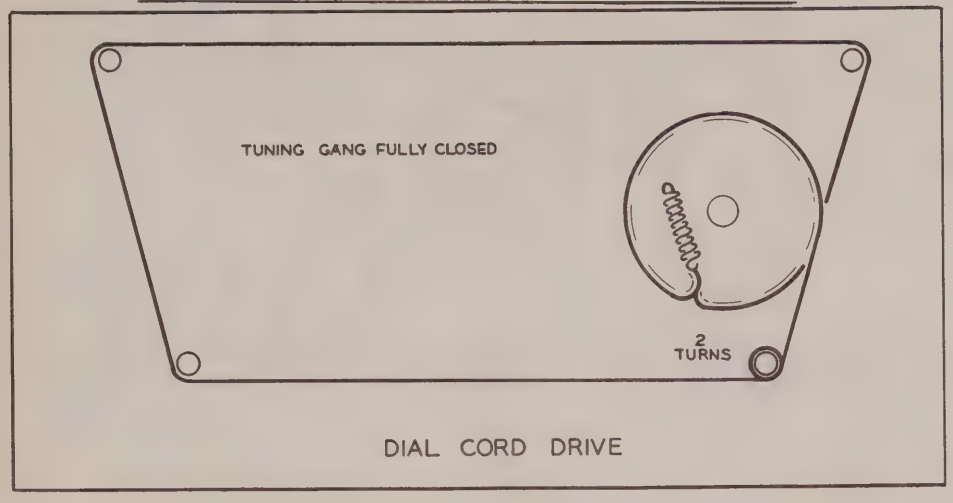
ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: TRUETONE PART No.	REPLACEMENT DATA: MEISSNER PART No.
L1	Ant. Input	50Ω	4.2Ω	51B1084	
L2	Osc. Coil	7.8Ω		51B1085	14-1060
L3	Input IF	12Ω	15Ω	51B412	
L4	Output IF	11Ω	9Ω	51B413	

BATTERIES

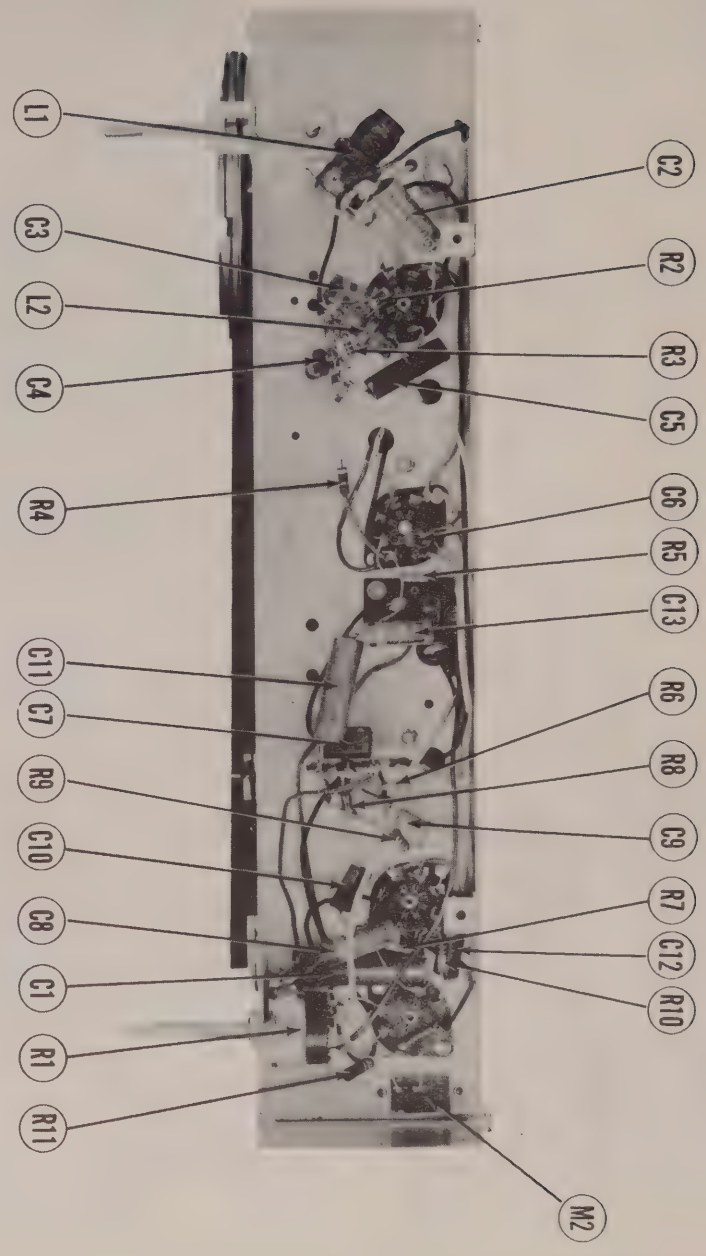
ITEM No.	VOLTAGE	TRUETONE PART No.	REPLACEMENT DATA: EVEREADY "A"	EVEREADY "B"	EVEREADY "A-B"	BURGESS "A"	BURGESS "B"	BURGESS "A-B"	INSTALLATION NOTES
M1	1.5V "A" 90V "B"				759			17GD60	

MISCELLANEOUS

ITEM No.	PART NAME	TRUETONE PART No.	NOTES
M2	Switch		Economizer (SPST)
M3	2 Gang Var. Cap	48B208	(39-487MMF, 20-135MMF)
	Cabinet	66D500	
	Dial Glass	22B225	
	Dial Pointer	82B155	



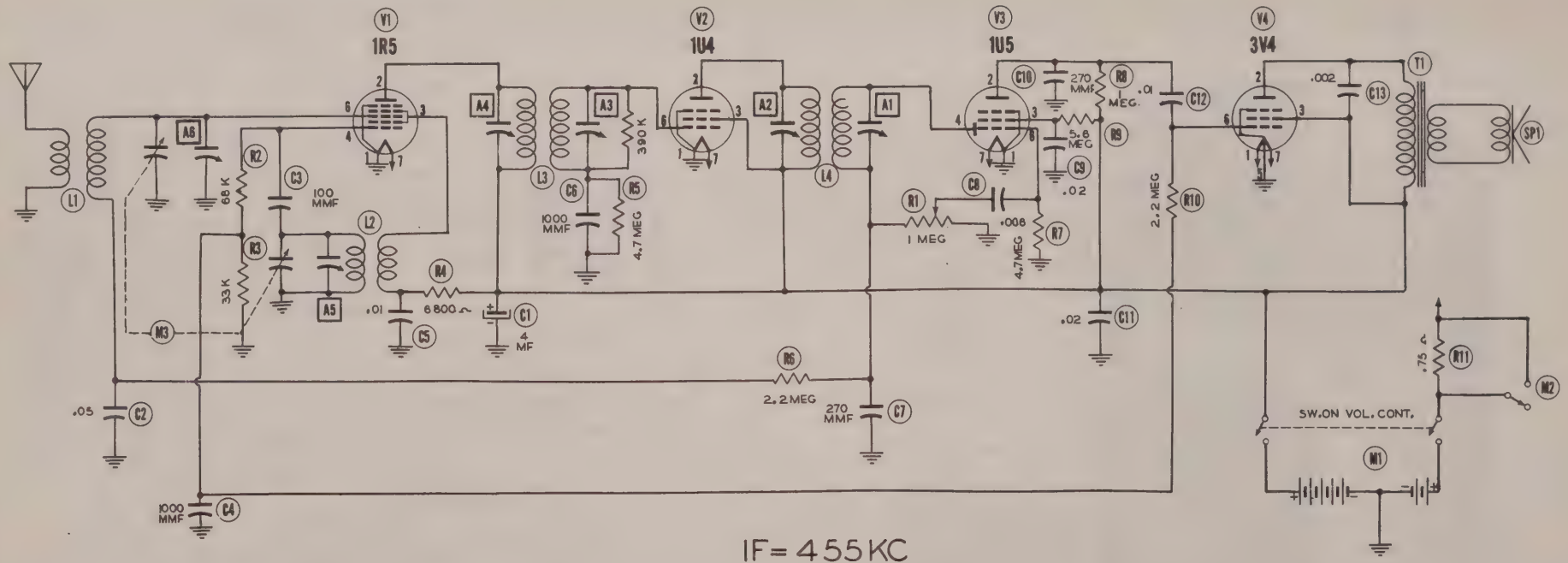
CHASSIS—BOTTOM VIEW



DATE 10/49 SET #73 FOLDER 13

TRUETONE MODEL D2962

TRUETONE MODEL D2963



IF = 455 KC

VOLTAGE AND RESISTANCE READINGS TAKEN WITH BATTERY SWITCH IN NEW POSITION.

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	1R5	0V	90VDC	70VDC	§-9.2 VDC	0V	0V	1.2VDC
V 2	1U4	0V	90VDC	90VDC	0V	0V	0V	1.2VDC
V 3	1U5	0V	21.5VDC	13VDC	0V	-5.2VDC	0V	1.2VDC
V 4	3V4	1.2VDC	90VDC	90VDC	0V	0V	-.4VDC	1.2VDC

§TAKEN WITH VACUUM TUBE VOLTMETER.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	1R5	*	†12Ω	†6.8KΩ	100KΩ	*	3 Meg.	*
V 2	1U4	*	†11Ω	†0Ω	4.7 Meg.	*	4.7 Meg.	*
V 3	1U5	*	†1 Meg.	†5.5 Meg	1 Meg.	33KΩ	4.7 Meg.	*
V 4	3V4	*	†320Ω	†0Ω	Inf.	*	2.2 Meg.	*

† Measured from B† Lead.

*DO NOT USE OHMMETER TO MEASURE FILAMENT RESISTANCE.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
5. Volume control at maximum, no signal applied for voltage measurements.

V-M
MODEL 405

V-M
MODEL 405

FIGURE 1

GENERAL INFORMATION

The V-M Model 405 is designed to play up to ten 12-inch, twelve 10-inch, or ten 10-inch and 12-inch, 78 RPM records intermixed, or the "Long Play" 33⅓ RPM records. *Caution: Do not intermix 78 RPM and 33⅓ RPM records.* A stack of twelve 7-inch 33⅓ RPM records may be played. A full stack of twelve 7-inch 45 RPM records may be played by using the conversion spring on the motor shaft.

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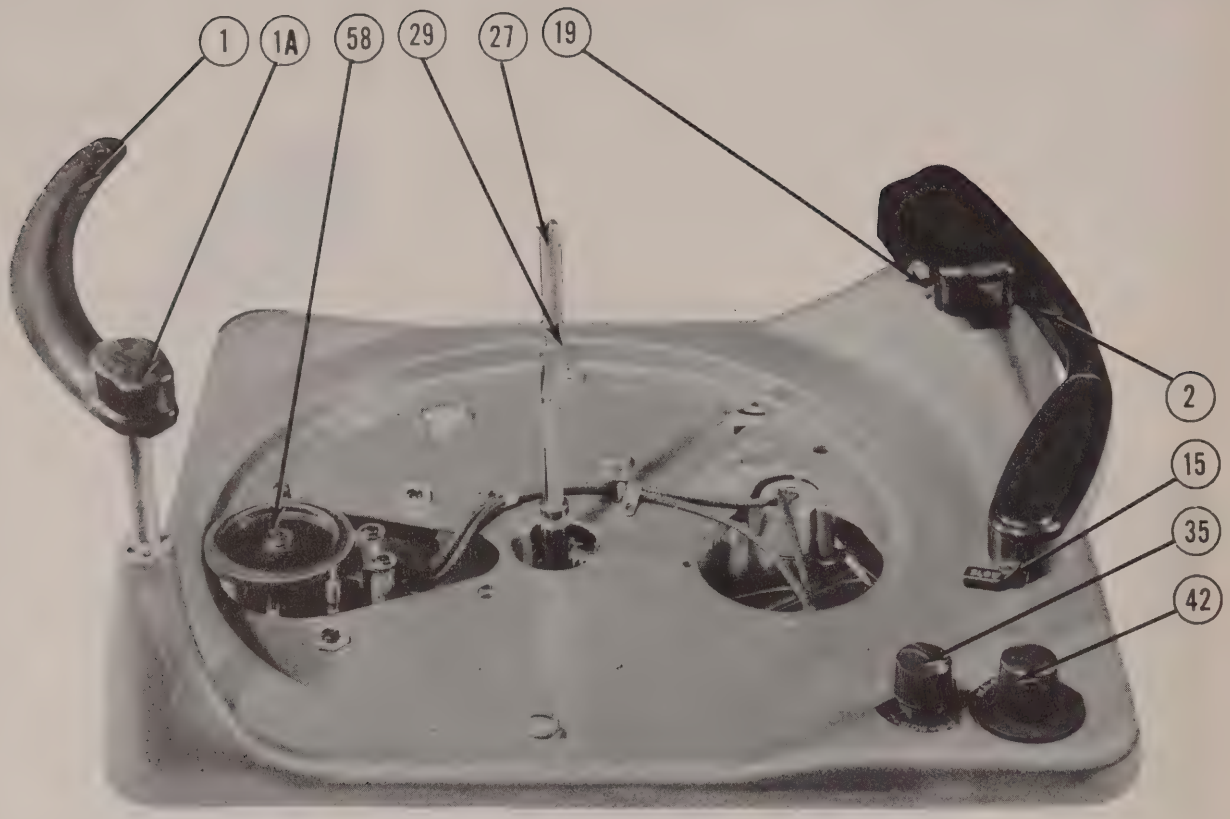


FIGURE 2

OPERATING

Loading

(Refer to Figure 2 for the following reference numbers.)

Pull the record support knob (1A) straight until the record support arm (1) clears the spindle. Swing the record support in either direction until the pin in the shaft drops into the locating groove. Place a stack of records on the offset shoulder on the spindle. Steady the record with one hand and replace the record support over the spindle. Gently press down on the record support knob until the records are held parallel with the turntable.

Starting

If Long-Play 33⅓ RPM records are to be played, turn the motor control knob (35) so the dot on the knob is in the position marked Slow 10-12. Rotate the cartridge lever (15) to the left. In this position, the cartridge is set for 33⅓ RPM records. "Slow," which is indicated on the lever (15), will be facing upward.

To play 7-inch 33⅓ RPM records, turn the motor control knob (35) so the dot on the knob is in the position marked "7." Rotate the cartridge lever (15) to the "Slow" position.

To play 7-inch 45 RPM records, turn the motor control knob (35) so the dot on the knob is in the position marked "7." Rotate the cartridge lever (15) to the "Slow" position. In order to obtain the 45 RPM needed to play these records, a conversion spring must be placed on the motor shaft. The turntable must be removed to place this spring on the shaft.

For standard 78 RPM records, turn the motor control knob (35) to the position marked "Standard" and rotate the cartridge lever (15) to the right to the position marked "Standard." The changer is now ready for the automatic operation.

Turn the control knob (42) clockwise to "Rej." and release. The changer will now operate automatically until the last record has been played, at which time the control knob (42) turns to the "Off" position, the pickup arm (2) returns to the rest, and the machine automatically stops.

Rejecting

To reject a record at any time while it is playing, turn the control knob to "Rej." and release.

Unloading

To remove records from the turntable, lift up on the record support knob and swing the record support in either direction until the pin in the shaft drops in the locating groove. Carefully lift the entire stack of records straight up.

CAUTION: When loading or unloading the changer, use

care to prevent bending the spindle. Records should never be left on the offset portion of the spindle as they may warp.

Stopping

To turn off the changer before the last record has been played, turn the control knob to "Off," lift the pickup arm from the record and replace on rest.

Manual Operation

Off-size, warped records, and home recordings, should be played manually. Raise the record support clear of the spindle and swing the record support in either direction until the pin in the support shaft drops into the locating groove. Carefully place a record on the turntable. For a record to pass the step on the spindle, tilt the record toward the back of the pickup arm and work the record carefully over the step. Place the record support (1) over the spindle, permitting it to rest on the step of the spindle. Set the motor knob (35) and crystal (14) to their relative position, depending on what type of record, 78 or 33⅓ RPM, is to be played. See paragraph on "Starting." Turn the control knob (42) to the "On," position; press down on the index lever (19), which is located near the back of the pickup arm (2). Place the pickup arm on the edge of the record. Upon completion of the record, the pickup arm will return to a rest position on the rest post; that is, if the record has an eccentric cutoff groove. If the record does not have an eccentric groove, turn the control knob (42) to "Rej." and release. The arm will then return to the pickup arm rest and shut off automatically. When playing "inside-out" records, press down on the index lever (19) and move the pickup arm all the

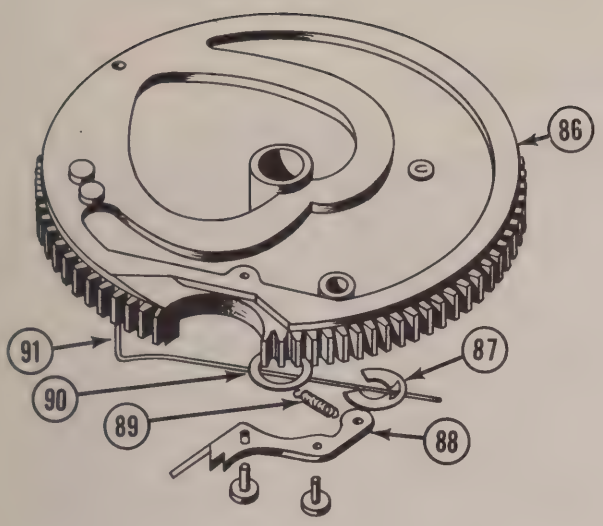


FIGURE 3

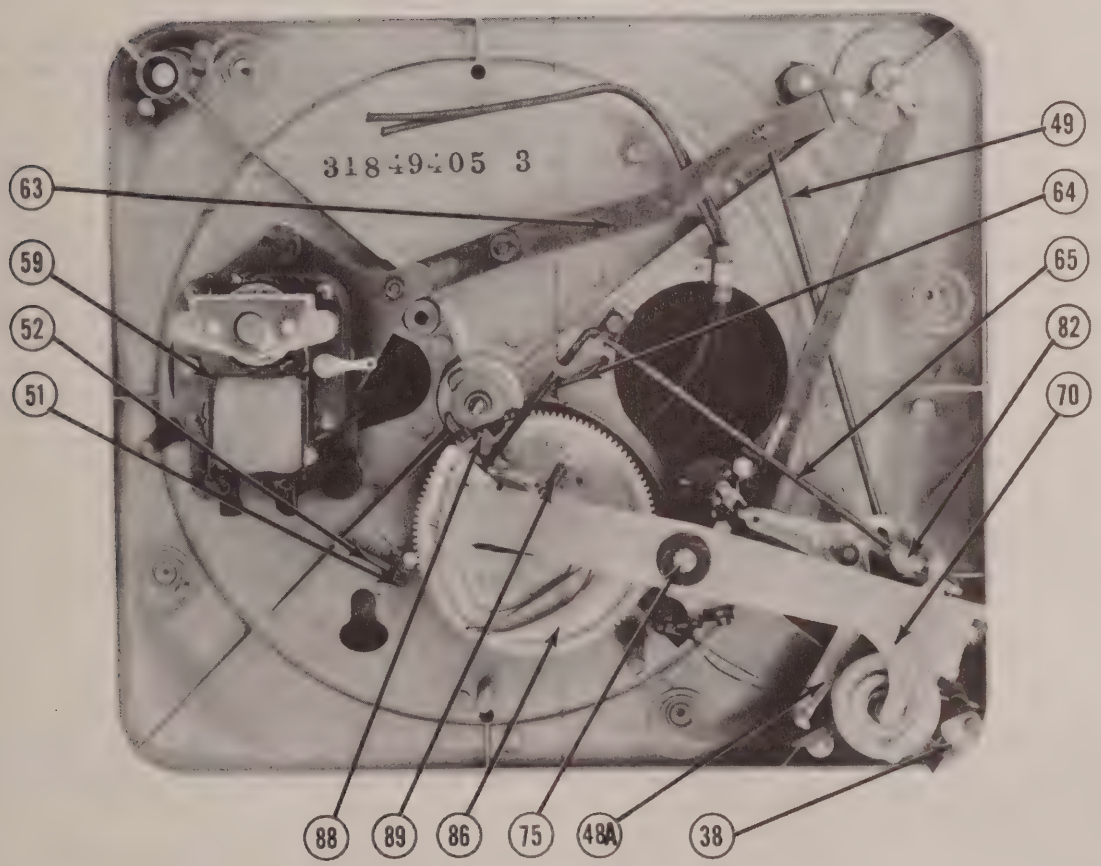


FIGURE 4

way in to the spindle before setting it down on the first playing groove of the record.

Repeating a Single Record

Pull the record support knob (1A) straight up until the record support arm (1) clears the spindle; then swing the record support arm in either direction until the pin in the shaft drops into the locating groove. Remove any records remaining above the offset shoulder of the spindle. The changer will now repeat the top record on the turntable until the control knob is turned to the "Off" position.

CHANGE CYCLE

At the end of the record, the oscillating action of the pickup arm in the eccentric groove causes the pawl of the ratchet arm (76), which has been sliding along the serrated portion of the ratchet (82), to straighten, pushing against the ratchet. This pivots the ratchet and trip rod (65) away from the cam clutch pawl (88) (Figure 3), allowing the pawl to engage with the teeth of the turntable hub, thus putting the cam in rotation, starting the change cycle.

As the main cam turns, the lift arm (70), shown in Figure 4, is actuated by the lift arm roller riding in the heart-shaped groove on the bottom of the cam gear (86). One end of the lift arm controls the movement of the pickup arm, while the other end actuates the spindle assembly (27). (Refer to the exploded view for the following reference numbers.) As the lift arm (70) moves, the lift rod (83) rides up cam surface of the lift arm, raising the pickup arm off the record. As soon as the pickup arm is fully raised, cam face (70A) contacts the boss extending down from the ratchet arm (76), swinging the pickup arm out to clear the records. As the pickup arm is swinging out, a projection on the set-down locator (44) snaps into a mating indentation in the ratchet arm (76) caused by the pressure of the lift arm spring (76) against the ratchet arm. When this occurs, the set-down locator turns with the ratchet. Inside the ratchet arm, the safety spring (47) holds a casting on the bottom of the pickup arm locator assembly (37), against a stop surface inside the ratchet arm, so that the two assemblies move together unless the pickup arm is held during the change cycle. In this case, the safety spring allows the ratchet arm to move even though the pickup arm is held, thus preventing injury to the mechanism.

The pickup arm is moved out until a stop extending down from the hinge body (16) strikes a stop in the baseplate. The pickup arm is now clear of the records so that they are free to drop to the turntable. After the hinge body strikes the stop, preventing the pickup arm and hinge body from moving farther, the lift arm boss (70B) contacts the arm of the set-down locator plate (44), turning the ratchet arm (76) a little farther around. By this movement, the following parts are also turned. The pickup arm locator plate (44), pickup arm locator (37), hinge bearing (22), and the adjusting ring (10). This causes a gap between the end of one leg of the catch (17) and the catch surface extending from the adjusting ring (10). This allows the catch spring (20) to pull the leg on the catch (17) around until it hits the stop extending out at right angles to the outer step in the leg on the adjusting ring (10). In this position, the pickup arm will set down for a 10-inch record. When a 12-inch record is dropped, the record hits the index lever (19), which, in turn, pivots the hinge cam (18) against the catch (17) moving it away from the outer step of the adjusting ring. The catch is held in this position by the step in the hinge cam, which rests on the surface of the catch, to prevent the catch from returning to its original position. The pickup arm is now set for 12-inch set-down by the tension of the ring spring (11), which pulls against the hinge body (16).

At approximately the same time the cam face (70A) contacts the boss of the ratchet arm, cam surface (70C) contacts the spindle roller (50). The roller now rides up the cam actuating the spindle assembly (27), thus dropping a record to the turntable.

The heart-shaped groove in the bottom of the cam now reverses the movement of the lift arm (70), returning the spindle assembly to its original position and swinging the pickup arm in, positioning it for set down and lowering it to the record. When the lift rod (83) is completely lowered, the tension of the rod spring (79) against the ratchet arm (76) is released. The ratchet arm will now drop down forming a gap between the indentation in the ratchet arm (76) and the projection on the locator (44). This allows the pickup arm to have free movement on the record.

(Refer to Figure 3 and Exploded View for the following reference numbers.)

The cam clutch pawl (88) of the main cam (86) now moves against the end of the trip rod (65), holding the pawl from engaging the teeth of the turntable hub. The open section of the main cam is held, in respect to the turntable hub, by the engagement of the cam locator (51) with the two studs on the top side of the main cam, thus completing the change cycle.

After the last record has been played, the record support (1), which is flush with the offset shoulder on the spindle (27), engages the pusher (29) and keeps it from completing its full travel. This prevents the spindle pusher housing (32) from completely retracting as the roller (50) rides up the lift arm cam surface (70C). When the roller reaches the top of the cam surface, the cutoff rod (84) engages the shoulder of the spindle pusher housing (32). This causes the cutoff rod (84) to rotate 90°. As the lift arm (70) reverses its motion, the opposite end of the cutoff rod engages the control lever pivoting the finger of the lever in the path of the set-down locator plate finger (44). This prevents the pickup arm from moving in over the record; further rotation of the lift arm (70) causes the control lever to actuate the switch (33) and control knob (42) to the off position. This completes the shutoff cycle of operation.

LUBRICATION

Additional lubrication should not be required for the life of the changer, but in cases of unusual use or high-operating temperature, the changer should be lubricated as follows (Refer to the exploded view):

Apply Lubriplate to

1. Hinge bearing (22).
2. Ratchet arm (76) and set-down locator plate (44).
3. Cam faces on lift arm (70), lift arm bearing, and lift arm cut-off rod bearings.
4. Between lever spring (85) and cut-off rod (84).
5. Heart-shaped cam track on cam (86) and cam bearing.
6. Spindle between roller plunger (30) and roller spring

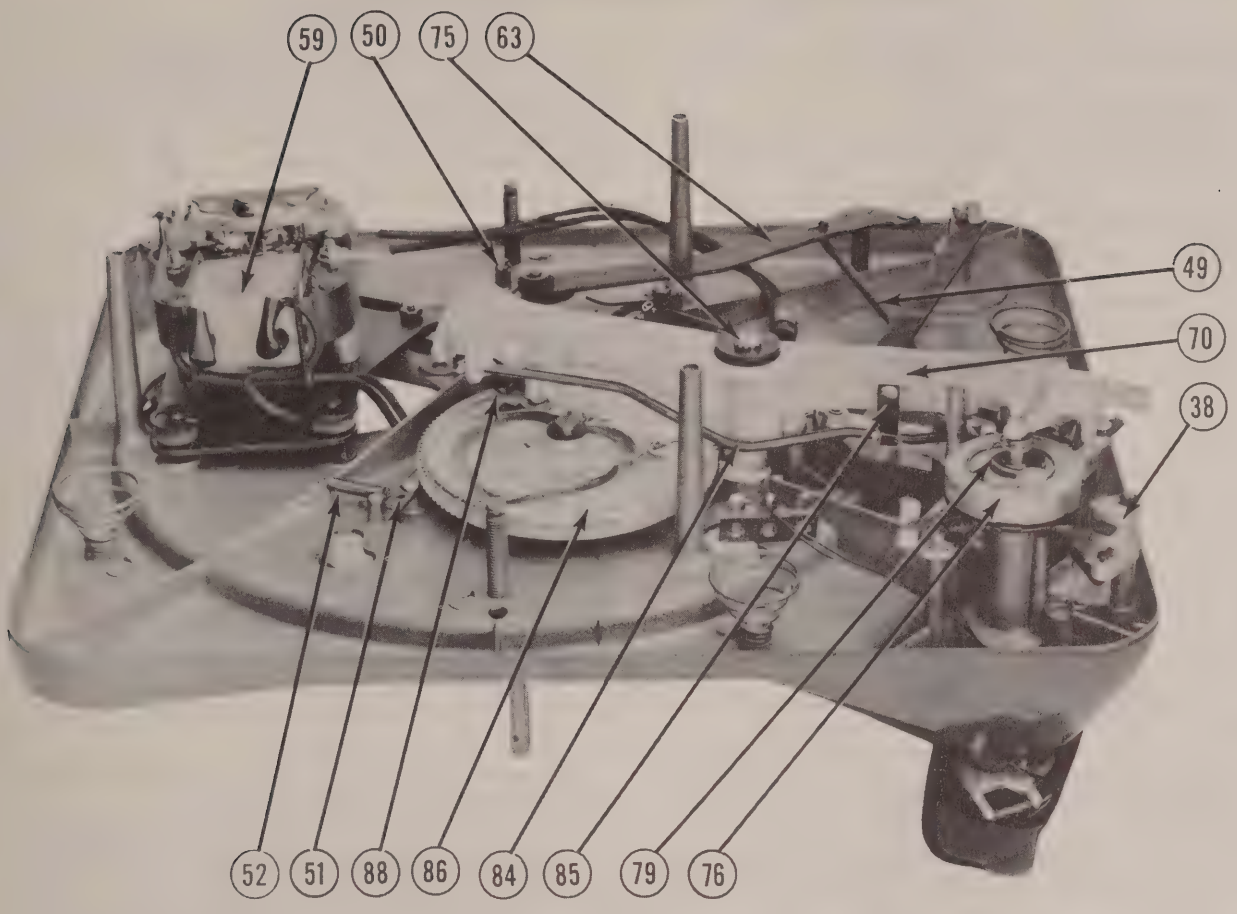


FIGURE 5

housing (32), and between the roller spring housing and the spindle body.

7. Turntable ballbearing.

8. Frictional surfaces of the motor shifting lever.

Apply a Small Quantity of Light Oil to

1. Pickup arm locator assembly bearing (37) and ballbearing in pickup arm post.

2. Ratchet pawl bearing of the ratchet arm assembly (76).

3. Trip rod (65) bearings.

4. Control lever bearing.

5. Turntable and spindle bearing.

ADJUSTMENTS

Pickup Arm Set-Down

(Refer to the Exploded View.)

The set-down position of the needle is adjusted by means of the two adjusting screws (12 and 13). If the needle is setting down too far out on the record, loosen the back screw (12) about ¼ turn and tighten the front screw (13) to lock the adjustment in place. If the needle is setting down too far in on the record, loosen the front screw and tighten the back screw.

Pickup Arm Height

(Refer to the Exploded View.)

The pickup arm height is adjusted by the screw (21) located on top of the pickup arm lift rod (83). Turn the screw out, or in, until the underneath side of the pickup arm clears the rest by ⅛" to 3/16".

Pickup Arm Weight

(Refer to the Exploded View.)

With the pickup arm control lever (15) in the slow position, the needle pressure should be between 6 and 10 grams. If the pressure is in excess of 10 grams, bend the drilled end of the hinge bracket (16A) away from the hinge bearing assembly (16). If the pressure is less than 6 grams, the needle may not track in the record grooves. To correct this condition, bend the drilled end (16A) of the hinge bracket forward in the direction of the hinge bearing assembly.

There is no adjustment for "Std." play pressure inasmuch as the pickup arm is designed to give this needle pressure.

SERVICE INFORMATION

Control Knob Cannot Be Turned to "On" Position

Machine shut off during cycle:

Turn the turntable clockwise, by hand, until the control knob is free.

Turntable Does Not Revolve When Control Knob Is Turned to "On" Position

1. Machine stalled in cycle:

Turn the turntable clockwise, by hand, until it starts rotating under its own power.

2. No current at motor:

a. Check to determine if current is reaching AC leads of changer.

b. Check the switch to determine if it is closing.

c. Check wiring and soldered terminals in the changer.

3. Motor defective:

Remove turntable to allow motor to operate without load. If current is reaching motor and pulley does not rotate, the motor is defective. Repair or replace.

4. Motor idler wheel not engaging turntable rim. If motor pulley is turning but turntable is not:

a. Check motor idler assembly to determine if it is free to contact the motor pulley and the turntable.

b. Wipe off the inside rim on the turntable to remove flock, or if oily, clean the turntable rim and rubber tire of the idler wheel (58) (shown in Exploded View) with carbon tetrachloride.

c. Spring (60) loose; not holding idler wheel in contact with motor shaft.

Changer Does Not Cycle When the Control Knob Is Turned to the "Rej." Position

(Refer to Figure 4.)

1. Manual reject not actuating the trip. Turn the control knob to the "Rej." position, hold, and see if the leg on the control lever (48A) is contacting the stud on the ratchet (82) and turning the trip rod (65) sufficiently to allow the trip rod to disengage the clutch pawl (88) (Figure 3).

2. Trip not actuating clutch:

When the trip rod 65) is turned, and the clutch pawl (88) does not move forward, engaging the teeth of the turntable, check for a loose pawl spring (89) or binding between the clutch pawl and the cam. If binding occurs, clean out foreign matter and check for freedom, but do not oil.

Record Does Not Drop When Changer Cycles

(Refer to the Exploded View.)

1. Spindle pusher shaft broken:

If the pusher shaft (inside the spindle) is broken, the roller assembly (50) will drop out of the spindle. Loosen the set screws (92) (Figure 4) and remove the spindle assembly (27). Replace with a new spindle unit.

2. Pusher in spindle not moving far enough forward to eject a record:

The pusher (29) should move up inside the spindle body, then move forward until it has reached a point flush with, or a maximum of, .010" beyond the spindle body. To assure that the pusher is all the way forward, the spindle roller (50) should be raised high enough by the lift arm (70) at the top of the cam face to slightly compress the roller spring inside the pusher housing (32). (See "Turntable Stalls During Cycle.") If the roller spring is compressed and the pusher (29) does not move far enough forward to eject a record, the spindle should be replaced. If a record is not pushed completely off the ledge, it may hang up on the spindle momentarily, then drop on the pickup arm when it moves in over the turntable.

3. Lift arm screw loose:

Check screw (75) to determine if it is turned all the way in.

4. Pusher raises outside spindle body:

When the changer cycles, the pusher (29) should first raise up inside the spindle body, then move forward inside the center hole in the record. If the pusher raises outside the spindle body, it will raise the record instead of pushing it off the spindle ledge. Remove the spindle and replace with a complete new spindle assembly.

5. Lift arm roller broken off:

If the lift arm roller (70D) is broken off, the lift arm (70) will not turn when the cam revolves.

Two Records Drop at Once

(Refer to the Exploded View and Figure 2.)

1. Hole in record too large:

Check the diameter of the hole in the record. An oversize hole will cause two records to drop at once.

2. Spindle slide not fully down:

If the spindle slide (28) is not all the way down, more than one record may be dropped at a time:

a. Check the slide to be sure it is free and does not bind at any point. Clean out foreign matter or straighten if necessary. Do not oil.

b. When records are placed on the spindle, be sure the slide is all the way down. The slide will normally raise slightly as a record is being dropped, but it should return to place immediately.

3. Record support binding on spindle or bent out of square with the shaft:

The record support must be able to slide freely, by gravity, down the spindle. If the support does not follow the records down as they are being ejected, two or more records may be ejected at once. If binding occurs:

a. Check the spindle to determine if it is straight. Bend carefully with the fingers, if necessary.

b. Straighten the record support (1) if it is not square with the record support shaft.

c. If the hole in the record support is not centered over the spindle after checking (a) and (b), bend the support shaft post on the baseplate until the hole in the record support is centered over the spindle.

d. When the pin in the record support shaft has just entered the slot in the record support shaft post on the baseplate, the play in the record support, as it is swung from one side to the other, should be equal on both sides of the spindle. To correct bent condition, hold the support shaft and carefully force the record support into the proper position. If the support is loose on the shaft, remove the knob and restake with hammer and punch.

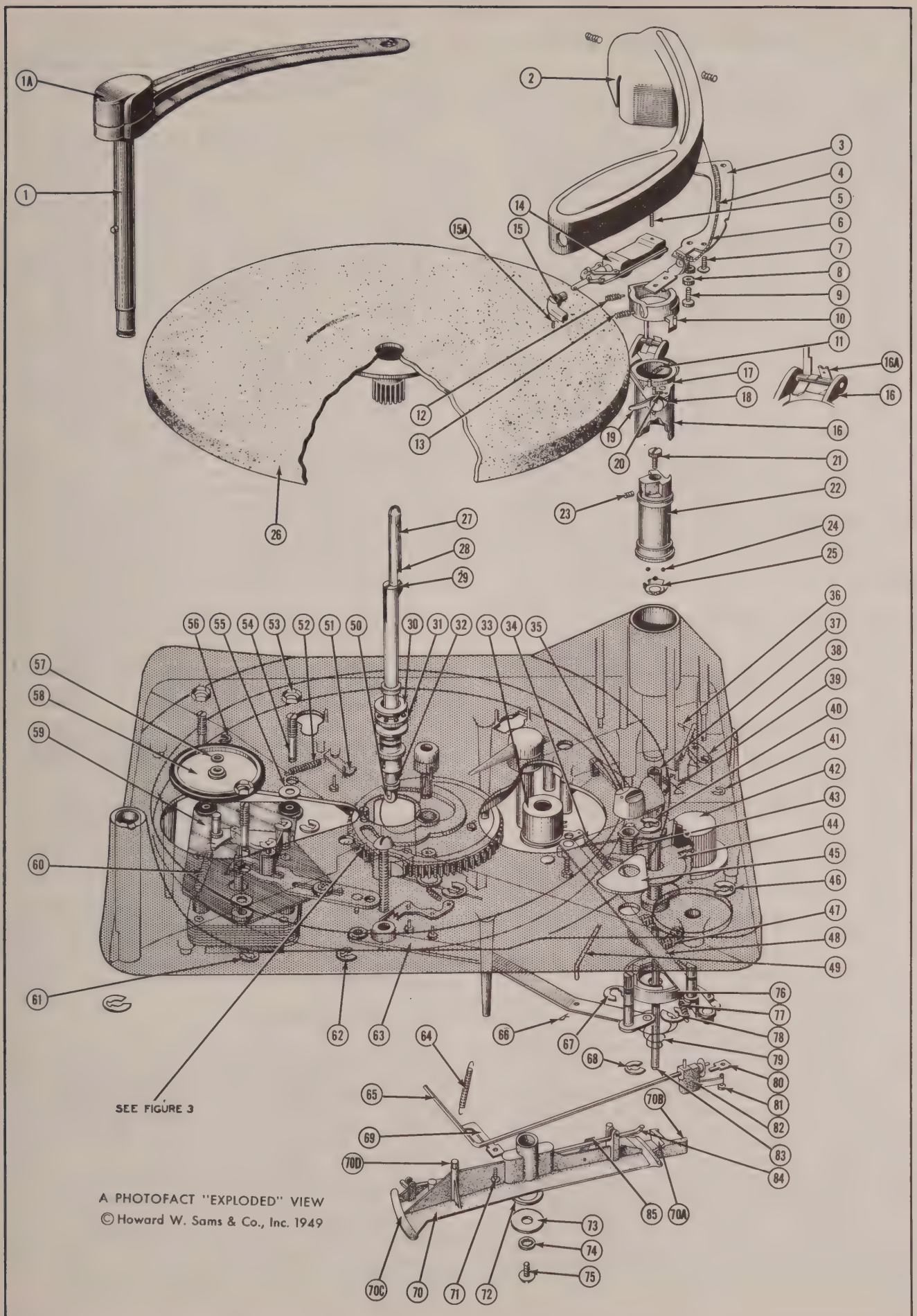
4. Record pusher defective:

The record pusher (29) may be deformed, etc. This may cause two records to drop at once. Replace with new spindle assembly or pusher (29).

Record Hits Pickup Arm

(Refer to the Exploded View.)

1. Pusher in spindle not moving far enough forward to



A PHOTOFACT "EXPLODED" VIEW

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eject record (see "Record Does Not Drop When Changer Cycles"—2).

2. Lift arm screw loose:

Tighten lift arm screw (75).

3. Pusher extending beyond outside diameter of spindle:

Cycle changer, by hand, until roller assembly (50) is at the top of its travel. Using a new record as a gauge, pass it over spindle to see if it binds at any point. File off high points on pusher (29) with a fine file until record will pass freely over spindle.

4. Pickup arm not adjusted properly:

The adjustment procedure for the needle set-down point is given under "Adjustments." If the hinge bearing (22) has been removed, or the hinge bearing set screw (23) has been loosened, the relationship between the hinge bearing and the pickup arm locator assembly (37) must be reset. The precedure is as follows:

Loosen the set screw (23) sufficiently to allow the hinge bearing to slide on the pickup arm locator assembly shaft. The set screw may be adjusted with an Allen wrench through the hole in the adjusting ring (10) located between the two adjusting screws (12 and 13). Place a 1/32" shim between the set-down locator (44) and the ratchet arm (76). Turn the control knob to the "Off" position. Raise the pickup arm and rotate the hinge assembly counterclockwise as far as it will go. In this position the arm extending from the set-down locator should be engaged by the turned-down leg on the control lever (48A). Take up all the play between the parts by pressing up on the bottom of the ratchet arm and down on the top of the hinge bearing. Tighten the hinge body set screw (23) and remove the shim.

Needle Does Not Set Down on 7" Record in Proper Position

1. 7-inch index rod (49) loose on 7-inch index cam (38), thereby not pivoting the cam (38) away from the locator plate (44).

2. Pickup arm not adjusted properly (see "Record Hits Pickup Arm"—4).

3. Hinge catch (17) does not return to the 10-inch position when the changer cycles (see "Needle Does Not Set Down on 10-inch Record in Proper Position"—2).

Needle Does Not Set Down on 10" Record in Proper Position

(Refer to the Exploded View.)

1. Pickup arm not adjusted properly (see "Record Hits Pickup Arm"—4).

2. Hinge catch (17) does not return to 10" record position when changer cycles:

a. Stop the machine in mid-cycle when the lift arm (70) has moved as far out as it will go and is about to move back to its starting position. Lift the pickup arm and see if there is a gap of at least 1/64" between the end of the leg on the catch (17) and the outside step on the adjusting ring (10). The catch should be free to allow it to be pulled forward against the stop at the end of the leg on the adjusting ring. If there is not enough gap, check the setting of the hinge body and the pickup arm locator (see "Record Hits Pickup Arm"—4). If the setting is incorrect, the cam face on the lift arm (70), which contacts the round stud on the bottom of the ratchet arm (76), may be bent. The ratchet arm should be forced around far enough to bring the pickup arm out until the stop on the bottom of the hinge casting meets the stop in the baseplate; then, to assure that the pickup arm is out as far as it will go, the lift arm should move the ratchet arm a few degrees farther around, which will slightly compress the safety spring (47) and hold the pickup arm out firmly against the stop.

b. Lubricate the hinge bearing with lubriplate. Do not use heavy grease. If the bearing between the hinge bearing and hinge body binds, the safety spring will compress instead of bringing the hinge body around firmly against the stop.

3. a. Binding between safety spring and ratchet arm: If the safety spring (47) binds against the ratchet arm, and does not hold the casting on the bottom of the pickup arm locator assembly (37) against the stop inside the ratchet arm, irregular needle set down will result. Disassemble the pickup arm locator assembly (37) by removing the lift arm (70), loosening the hinge bearing set screw (23), and pull the ratchet arm and pickup arm locator assemblies down from the bottom of the changer. Hold the pickup arm locator shaft in one hand, turn the ratchet arm assembly to slightly compress the safety spring, release, and see if the safety spring returns the pickup locator casting firmly against the stop surface in the ratchet arm assembly. If binding occurs, remove the safety spring to see if the pickup arm locator casting turns freely in the ratchet arm casting. Remove burrs, or sharp edge, on end of safety spring, stretch safety spring a little to increase tension, and replace.

b. Check to see if the locator plate (44) is meshing with the ratchet arm (76) when the lift rod (83) is positioned at the beginning of the sloping cam surface of the lift arm (70) in the final stage of the cycle.

To test the meshing of the locator plate and the ratchet arm, swing the tone arm half way in toward the spindle. If the locator plate and the ratchet arm disengage when in the above position, it is necessary to reset the clearance between the locator plate and the ratchet arm. Also, it may be necessary to file off any burrs which may be present on the mating surfaces of the locator plate and the ratchet arm.

4. Hinge catch does not disengage from the hinge cam:

When the index lever (19) has been depressed, it is held in the position until the catch (17) is disengaged (see "Needle Does Not Set Down on 12" Record in Proper Position"—6). When the cycle is completed, if the catch does not disengage from the hinge cam (18):

a. Check to determine if the leg on the catch (17) is sliding down the incline on the leg of the adjusting ring (10) (see "Needle Does Not Set Down on 12" Record in Proper Position"—6).

b. The catch (17) and the hinge came (18) are not disengaging when the catch leg is resting on the inside step on the adjusting ring. If this occurs, file the edge of the catch which contacts the hinge cam until the two parts have a clearance between them of about 1/64" when the leg on the catch is on the inside step on the adjusting ring.

5. The 7" index rod (49) loose on 7-inch index cam (38); thereby leaving the 7-inch index cam in an inward position.

Needle Does Not Set Down on 12" Record in Proper Position

(Refer to the Exploded View.)

1. Diameter of 12" record undersize:

The set-down position of the needle for 12" records is determined by the edge of the record striking the index lever (19). If a 12" record has a diameter of less than the standard size of 11⅞", plus or minus 1/32", it may fail to depress the trip lever far enough.

2. Enlarged center hole in record:

An enlarged center hole might fail to set the index lever because it could produce the same effect as a small record.

3. Pickup arm not adjusted properly (see "Record Hits Pickup Arm"—4).

4. Binding between safety spring and ratchet arm (see "Needle Does Not Set Down on 10" Record in Proper Position"—3).

5. Index lever does not cock when 12" record drops:

Allow a 12" record to drop to the turntable and stop the changer, just after it falls, before the pickup arm has a chance to move in over the record. The index lever (19) should be forced down until the step on the hinge cam (18) passes the edge of the catch (17), preventing the hinge cam and the index lever from returning to their original position. If the index lever does not stay down in a depressed position:

a. Check the catch (17) to see if it is free to move forward and engage the hinge cam.

b. If the stop on the hinge body (16) is defective, it might allow the pickup arm to move too far out, thus moving the index lever away from the spindle. This would produce the same effect as an undersize record.

6. Hinge catch does not go inside step on adjusting ring when index lever is depressed:

When the index lever (19) is tripped by a falling 12" record, the leg on the catch (17) should be moved out over the incline between the inside and outside steps on the adjusting ring leg and held in that position by the shoulder on the hinge cam (18) until the pickup arm starts to move in over the record. When this occurs, the leg on the catch should contact the incline and be moved out as it slides down the incline until the catch is disengaged and the index lever can snap back up to a horizontal position. If the leg on the catch is not moved out far enough to enable it to slide down the incline, file about 1/64" chamfer on the edge of the catch leg which contacts the incline.

Check for binding between hinge body (16) and hinge bearing (22). Burrs on the bearing surfaces, or lack of lubrication, may prevent the hinge bearing from turning freely.

The 7-inch index rod (49) loose on 7-inch index cam (38), thereby leaving the cam (38) in an inward position.

Needle Does Not Track Across Record Properly

1. Needle may be clogged by accumulation of lint, dirt, etc.

2. Ratchet arm does not disengage from the set-down locator when a cycle is completed.

a. There should be a 1/32" gap between the ratchet arm and the set-down locator when the machine is not in a cycle. If the gap is small enough to allow the parts to touch and bind as the needle moves across the record, the hinge bearing must be reset (see "Record Hits Pickup Arm" —4).

3. Hinge bearing binds:

Place a block under the back end of the pickup arm to prevent the needle from touching the turntable. With sensitive gram scale, check the amount of force required to move the pickup arm across the turntable. The force required should not exceed 2 grams. If the pressure required is excessive:

a. Check the ratchet arm and set-down locator for binding (see 2 above).

b. Check the bearing in the pickup arm for binding. The bearing is located below the hinge bearing (22). To inspect it, loosen the set screw (23) in the hinge bearing. Unsolder the pickup leads and pull them out. Pull up on the hinge and pickup assemblies. Clean foreign matter or corrosion from the bearings; lubricate with light oil. (To reset position, see "Record Hits Pickup Arm"—4.)

4. Insufficient weight of the pickup arm when in "slow" position:

If the needle does not track across the record when in "Slow" position, after 1, 2, and 3 have been checked, it may be found that the weight of the arm is not great enough to hold the needle in the grooves of the record:

a. Check the weight of the pickup arm with a gram scale. The weight of the arm should be between 6 and 10 grams.

Changer Trips Before Needle Reaches End of Record

1. Hole in record too large:

If hole in record is too large, the groove may turn eccentric with the spindle and cause premature tripping.

2. Insufficient tension on trip spring:

The trip spring (64) should have enough tension to pull the trip rod back to a fully engaged position if an eccentric record is being played.

3. Binding in trip rod bearings:

With the trip released, check the trip rod for play in the bearings. It should be free to turn without binding.

Changer Does Not Cycle When Record Has Been Played

(Refer to Figure 4.)

1. Binding in trip rod bearings (see "Changer Trips Before Needle Reaches End of Record"—3).

2. No eccentric trip groove on record:

All standard records made today have an eccentric trip groove, but some records made in the past did not have this groove. When records of this type are being played, the control knob must be returned to "Rej." at the end of the record.

3. Ratchet pawl not engaging the ratchet sector:

The ratchet pawl of the ratchet arm (76) must press against the ratchet sector forcing it back when the motion of the pickup arm is reversed. If the pawl does not contact the ratchet sector or slides over it:

a. Check the pawl for burrs around the hole.

b. Be sure the pawl is free to turn on the bearing. If the drive pin is driven down too far, causing binding, the pin may be relieved by tapping up on the shank.

c. Check the pawl spring (77) for insufficient tension.

d. Check the point on the pawl. It should be sharp to enable it to dig into the ratchet teeth. Sharpen with stone, if necessary.

4. Ratchet sector too far away from ratchet pawl:

If the ratchet sector (82) is too far away from the pawl, the eccentric motion required to operate the trip will be excessive. If necessary, bend the trip bracket in slightly to reduce the distance. If the sector is too close to the pawl, excessive trip pressure will result.

5. Needle jumps out of eccentric groove in record.

a. Check trip pressure. It should not exceed 8 grams. (If the pressure is excessive, see paragraph 4 immediately preceding.)

b. The record may be defective. The trip groove is often too shallow. Check with a record which is known to be good.

c. The needle point may be damaged or affected by an excessive accumulation of dust, lint, etc.

d. There may be binding in the pickup bearing or ratchet arm (see "Needle Does Not Track Across Record Properly"—2 and 3).

6. Clutch pawl binding on cam face:

The clutch pawl (88) must be free to move forward and engage the teeth of the turntable hub when the trip rod releases it. Check for burrs or foreign matter lodged between the pawl and the cam. Do not oil as this might collect dirt and gum up the pawl.

Pickup Arm Strikes Records on Spindle When it Raises or Pickup Arm Rest When it Moves Out

Pickup arm height not adjusted properly (see instructions for adjusting the pickup arm height under *"Adjustments"*).

Turntable Speed too Slow

(Refer to the Exploded View.)

1. Binding in turntable bearing:

Check the turntable bearing for freedom. Hold the motor idler wheel (58) out of engagement with the turntable and spin the turntable, by hand, to see if it turns readily and coasts for a long time. If binding occurs, remove turntable, foreign matter, and lubricate with light oil.

2. Motor pulley too small in diameter. Replace the motor pulley with one having a greater diameter.

3. Line voltage too low. The line voltage should not be less than 100 volts or the turntable may be too slow.

4. Operating temperature too low. If the machine has been stored in a cold place, or operated in surroundings at a temperature of less than 60° F., the turntable speed may be too slow.

Turntable Speed too Fast

Motor pulley too large in diameter. Replace the pulley with one having a smaller diameter, or grind one or two thousandths off the pulley.

Turntable Does Not Rotate at 33⅓ RPM When in "Slow" Position

1. Check the idler wheel bracket to see if it is properly positioned when the control knob is rotated from "Std." to "Slow" position.

2. Check idler wheel (58) to see if it is engaging the small diameter of the motor pulley.

Turntable Stalls During Cycle

(Refer to the Exploded View.)

1. Motor idler not engaging turntable (see "Turntable Does Not Revolve When Control Knob Is Turned to 'On' Position"—4).

2. Turntable bearing tight (see "Turntable Speed too Slow"—1).

3. Operating temperature too low (see "Turntable Speed too Slow"—4).

4. Line voltage too low.

The line voltage should not be less than 100 volts.

5. Binding in drive mechanism:

a. Remove lift arm (70) and hold idler (58) away from the turntable, or remove idler wheel. Cycle machine, turning turntable slowly by hand. The cam should turn freely for the complete revolution without binding at any point. If binding occurs, check for foreign matter in the gear teeth, a bent cam bearing or bent spindle bushing.

b. Replace lift arm, loosen spindle screw (92) (Figure 4), and raise spindle high enough to clear the lift cam when the machine cycles. Hold the pickup arm lift rod (83) up so the end of the lift rod does not contact the lift arm cam. Cycle the machine by hand. The entire cycle should be free, without binding at any point. If binding occurs, check the lift arm bearing for freedom, and the lift arm roller to be sure it is not bent, causing binding in the cam track.

6. Binding between pickup arm lift rod and lift arm cam face. Cycle machine, stopping it halfway through the cycle just as the lift arm is about to return. Lift pickup arm and raise lift rod (83) by pulling up on the adjusting screw (21) as high as it will go. Feel the lift arm (70) for play. The lift rod may still touch the lift arm cam face, but it should not bind. If binding occurs, the lift arm bearing may be bent or the fiber washer (72) under the lift arm should be removed to lower the lift arm.

7. Spindle roller spring compressed too far. Cycle the changer and watch the relationship between the bottom of the pusher housing (32) and the roller (50). Just before the top of the lift arm cam raise is reached, the pusher housing should stop its upward motion and the roller should continue up .005" to .047" more, slightly compressing the roller spring. If the spring compresses too much, the changer may stall on the shut-off cycle. Check the lift arm bearing to determine if it is square with the baseplate. It should be 90° to the baseplate within ¼°. If it is bent, carefully pound into place with a soft mallet. If it is straight and the roller spring is being compressed too much, remove the fiber washer (72) between the lift arm and the steel washer under it.

8. Motor weak. In cases where everything checks all right, but the changer still stalls in cycle, the motor may be weak.

Changer Continues to Cycle

(Refer to Figure 4.)

1. Trip rod not holding clutch pawl out of engagement with the teeth on the turntable hub. The end of the trip rod (65) should contact the bent-up section of the clutch pawl (88) and push the pawl out of engagement with the teeth on the turntable hub. If the trip rod is not free to meet the clutch pawl, continuous cycling will result:

a. See if trip spring (64) is in place.

b. Insufficient tension on the trip spring (64).

c. Check the trip rod (65) for freedom in its bearings.

2. Defective clutch pawl (88).

3. Reject control holding trip open. Check the control knob (42), control link (48), and control lever (48A) for binding to determine if the control assembly is holding the trip rod in a disengaged position with the clutch pawl.

Noise During Playing of Record

1. Rumble:

a. From motor: If a low-pitched rumbling sound comes from the loud speaker while a record is being played, check the motor grommets (exploded view) to be sure the motor is freely suspended on them. The motor lead wires should have slack to allow the motor to float. Motor rumble may also come from an out-of-balance motor rotor. In this case, the motor should be replaced.

b. From bearings: Defective turntable bearings can cause rumble. Check for foreign matter in the bearing, defective balls, binding between balls, and ball retainer; rough surface on washers. Clean ballbearing, sleeve bearing, and washers; lubricate with lubriplate or light oil.

2. Defective motor idler wheel:

A rapid thumping sound while the motor is running may indicate a flat spot on the motor idler wheel (exploded view). If this condition does not clear up after ten minutes of run-in-time, remove the turntable and check the rubber tire on the idler. If the surface of the rubber tire is not smooth and even, replace the idler.

3. Defective record:

Worn or defective records cause needle scratch and distortion of the recorded sound. If the record is warped, it may slip on the other records, causing "Wow," a waver in

the recorded sound. An enlarged hole in the record can also cause "Wow."

4. Turntable scrapes:

If a scraping sound occurs as the turntable revolves, check:

a. Turntable warped, causing outer rim to rise and fall.

b. Motor idler or mounting plate bent.

c. Wires beneath turntable rubbing.

5. Squeaks:

Squeaking sound, as changer operates, indicates lack of oil. Lubricate points indicated under "Lubrication."

Distortion of Recorded Sound

1. Defective record (see "Noise During Playing of Record"—3).

2. Defective amplifier:

Check phonograph amplifier and speaker.

3. Bad cartridge.

No Sound During Playing

1. Defective cartridge.

2. Defective wiring.

Check pickup leads for a shorted or open lead.

3. Defective amplifier.

Excessive Record Wear

1. Binding in pickup arm (see "Needle Does Not Track Across Record Properly"—2 and 3).

2. Excessive weight of the pickup arm when playing the new L.P. 33⅓ RPM records:

a. Check the cartridge to see if it is in the "Slow" position.

b. Check weight of pickup arm, while in "Slow" position, with a gram scale. The weight of the arm should not exceed 10 grams.

Changer Does Not Shut Off After Last Record Has Been Played

(Refer to the Exploded View and Figure 5.)

1. Record support binding on spindle:

The record support (1) must rest on the off-set shoulder of the spindle or the changer will not shut off (see "Two Records Drop at Once"—3).

2. Cut-off rod (84) not engaging shoulder on spindle pusher housing (32):

On the shut-off cycle, the end of cut-off rod (84) should contact the shoulder on the bottom of the spindle pusher housing (32) and turn the cut-off rod over 90°. If the end of the cut-off rod passes under the pusher housing as the machine cycles on the shut-off cycle, check:

a. The record support to be sure it is resting on the spindle (see 1, above).

b. The spindle to see if it is being held in place by the spindle set screws (92).

c. The lift arm screw (75), to be sure it is tight.

d. The bent-up end of the cut-off rod (84) may be short. Replace, if necessary.

Pickup Arm Does Not Set Down on Rest After Last Record Has Been Played

Control lever does not engage set-down locator. On the shut-off cycle, the leg of the control lever (48A) should catch the set-down locator (44) holding it to prevent the return spring (39) from pulling the pickup arm in. The pickup arm should be held against the stop in the baseplate. In this position, the nest in the pickup arm should be directly above the pickup rest.

Pickup Arm Returns to Rest Instead of Setting Down on Start of Record When Control Knob Is Turned to "Reject" Position

1. Check to insure the proper amount of tolerance between locator plate (44) and ratchet arm assembly (76) (see "Record Hits Pickup Arm"—4). Check also to see if the detented portion of the two parts mesh properly during the change cycle and disengage upon completion of the cycle.

2. Check to be sure that the "adjusting tail" item (44A) on the locator plate (44) (Figure 5) has not been damaged. This should engage with the lift arm assembly (70), during the change cycle, to cause the ratchet arm assembly item (76) to mesh properly with the set-down locator plate item (44).

Changer Shuts Off Prematurely

(Refer to the Exploded View.)

1. Spindle roller spring compressed too far (see "Turntable Stalls During Cycle"—7).

2. Roller spring in spindle too weak.

When the bottom record of a stack of ten 12" records is being ejected from the spindle ledge, the roller spring (in the housing) should not compress until just before the roller reaches the top of the cam incline on the lift arm. If the roller spring is compressed under the load of a full stack of records, it may cause premature shutoff. Replace with a complete spindle assembly (27).

3. Record too thick.

The changer is designed to play standard records. If an old-style ⅛" thick record is used, the changer will shut off instead of dropping the record.

4. Cut-off rod not being reset:

After the shut-off cycle, when the cut-off rod (84) has been turned to throw the switch to the "Off" position, the rod should be returned to its original position, the next time the machine cycles, by the bent-up end of the cut-off rod contacting the round stud on one leg of the control lever (48A). The flat spring (85), acting against the cut-off rod, should throw the rod against its stop on the lift arm (70) and hold it there. If the cut-off rod is not fully turned, the bent-up end next to the spindle may stick up high enough to prematurely contact the shoulder on the pusher housing (32):

a. Check the lever spring (85) for tension. Remove and bend slightly to increase tension, if necessary.

b. Lubricate the cut-off rod bearings and around the lever spring with lubriplate or oil.

c. Check the clearance between the end of the cut-off rod (84), which passes under the control lever (48A), and the bottom of the round stud on the control lever. When the cut-off rod is in its normal operating position, it should not clear the bottom of the round stud by more than enough to completely turn the end of the cut-off rod from vertical position back to a horizontal position.

Turntable Continues to Rotate When Control Knob Is Turned to "Off" Position

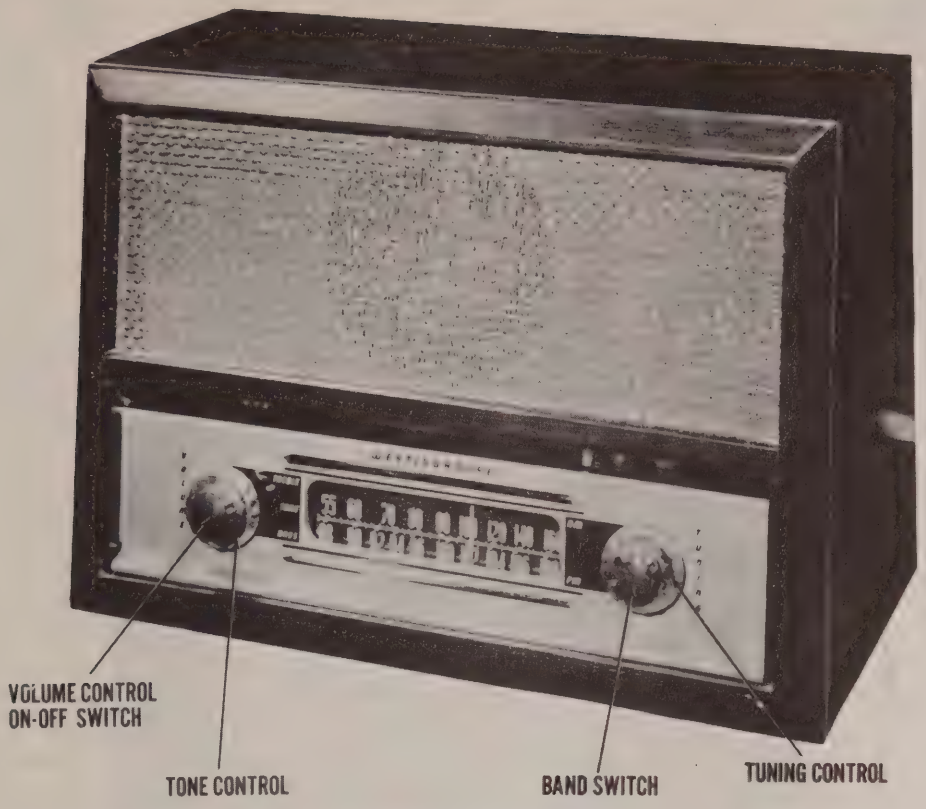
Switch defective.

Check switch for defects and replace if necessary.

PARTS LIST

Ref. No.	Part No.	DESCRIPTION
1	1799	Record support assembly
		1711 knob
		1716 cross pin
1A	1711	Knob (part of item 1)
2	2365	Pickup arm assembly—consists of:
		2392-B pickup arm
		2778 cable and clip assembly
		2377 strengthener assembly
		2370 set screw for plastic lever
		2336-9 plastic control lever
		2317 cartridge screw
		2308 screw for plastic arm
		2306 spacer
		713 screw for mounting strengthener
		2197 cartridge (Webster F-14) with needles
		2630 dual needle for webster cartridge
		2606 cartridge (shure with needle)
		2628 one-mil needle for shure cartridge
		2629 three-mil needle for shure cartridge
3	2377	Strengthener assembly
4	2492	Spring and chain
5	2317	Cartridge screw
6	2319	Chain only
7	713	Screw for mounting strengthener
8	2306	Spacer
9	2308	Screw for mounting strengthener
10	1840	Adjusting ring assembly
11	1574	Spring
12	1580	Adjusting screw
13	1580	Adjusting screw
14	2197	Cartridge (Webster F-14) with needles
	2630	Dual needle for Webster cartridge
	2606	Cartridge (shure) with needles
15	2336-9	Plastic control lever
15A	2370	Set screw for plastic lever
16	2043	Hinge assembly—consists of:
		1512 hinge bearing assembly
		1610 set screw
		1547 drive pin
		1575 index cam spring
		1578 catch
		1579 drive pin
		2314 bracket
		2042 hinge body
		1581 index cam
		1582 index lever
		1583 catch spring
		1621 lever return spring
		1840 adjusting ring assembly
		1574 spring
		1580 adjusting screw
		1846 selector washer
17	1578	Catch (part of item 16)
18	1581	Index cam (part of item 16)
19	1582	Index lever (part of item 16)
20	1583	Catch spring
21	1616-B	Height adjusting screw (part of item 83)
22	1512	Hinge bearing assembly (including item 23)
23	1610	Set screw
24	724	Ballbearing for pickup arm assembly
25	1614	Bearing spacer for hinge body assembly
26	1505-A	Turntable assembly
27	1566	Spindle assembly—consists of:
		1552 record pusher
		1535 pin spindle roller
		1536 spindle roller
		1557 spindle pusher shaft
		1559 pusher pin
		1560 pusher shaft spring
		1561 roller spring housing
		1562 roller spring
		1564 groove pin
		1565 roller plunger
		1687 spring guide
28	1687	Spindle guide (part of item 27)
29	1552	Record pusher (part of item 27)
30	1568	Turntable washer
31	1569	Turntable bearing
32	1561	Roller spring housing (part of item 27)
33	1519	A.C. switch assembly—consists of:
		1629 switch plate
		467 switch
34	1721	Reject spring
35	2198	Speed control knob
36	2661	Hairpin clip
37	1522	Pickup arm locator assembly—consists of:
		1612 pickup shaft
		1634 pickup locator
38	2643	7" index cam
39	1631	Locator spring
40	1719	"C" washer
41	1588	"C" washer
42	2054-B	Control knob
43	2354	Speed control shaft bearing
44	2648	Set-down locator plate
45	2444	Escutcheon for speed control
46	1719	"C" washer for control crank
47	1638	Safety spring for pickup arm and hinge assembly
48	1725	Control link
49	2645	7" index rod
50	1536	Spindle roller (part of item 27)
51	1919	Cam locator
52	419	Cam locator spring
53	2360	Pal nut
54	2358	Motor mounting screws
55	2359	Washer for motor mounting
56		"C" washer for idler wheel (part of item 59)
57		Fiber washer for idler wheel (part of item 59)
58	2635	Idler wheel
59	2352	Motor (Russell 117-volt, 60-cycle)
60		Idler wheel tension spring (part of item 59)
61	1736	"C" washer for motor mounting
62	1719	"C" washer
63	2646	Speed control link
64	133	Trip spring
65	1534	Trip rod and ratchet assembly
		1585 trip rod
		1590 ratchet
66	2661	Hairpin clip
67	1650	"C" washer
68	1650	"C" washer
69	2144	Trip rod bearing
70	1509	Lift arm assembly—consists of:
		68 roller drive pin
		1595 cut-off rod
		1596 pin 1 for cut-off rod
		1597 roller
		1599 lever spring
		2185 rivet
		1846 washer
71	1916	Trip bearing screw
72	1637	Fiber washer 1/64" thick
73	1568	Steel washer
74		Lockwasher
75	277	Screw no. 8-32 x ⅜
76	2362	Ratchet arm assembly—consists of:
		1547 drive pin
		2323 pawl
		2329 pawl spring
77	2329	Pawl spring
78	1652	"C" washer
79	1620	Spring for lift rod
80	1587	Trip rod bearing
81	709A	Screw no. 6 x ¼ Type Z
82	1590	Ratchet (part of item 92)
83	1513	Lift rod assembly—consists of:
		1613 lift rod
		1616-B screw
84	1595	Cut-off rod
85	1599	Lever spring
86	2495	Cam assembly—consists of:
		94 rivet
		120 lug
		1547 drive pin
		2445 spring
		1918 cam pawl
		1920 cam stud sleeving
		2338 wire spring
87	1651	"C" washer for main cam
88	1918	Cam pawl
89	2445	Spring
90		Fiber washer
91	2338	Wire spring

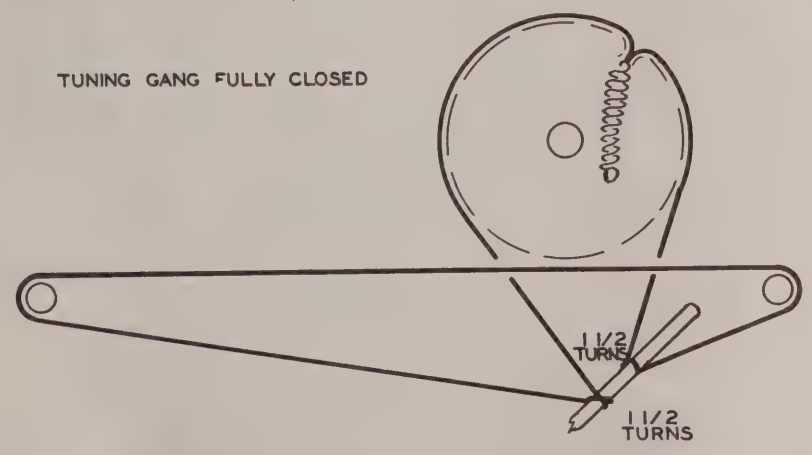
WESTINGHOUSE MODEL
H-198 (Ch. V-2137-2)



WESTINGHOUSE MODEL
H-198 (Ch. V-2137-2)

WESTINGHOUSE MODEL H-198

TRADE NAME	Westinghouse, Model H-198 (Ch. V-2137-2)
MANUFACTURER	Westinghouse Electric Corp., Receiver Div., Sunbury, Pa.
TYPE SET	AC Operated AM-FM Superheterodyne Receiver with Loop Antenna
TUBES(EIGHT)	Types 12AT7 FM RF Amp.-FM Mixer, 6BE6 FM Osc.-AM Converter, 6BA6 1st IF Amp., 6BA6 FM 2nd IF Amp., 6AL5 Ratio Det., 6AV6 DET-AVC-AF, 6V6GT Power Output, 5Y3GT Rectifier.
POWER SUPPLY	105-120 Volts AC — RATING: .73 Amp. @ 117 Volts AC
TUNING RANGE-BROADCAST	540-1600KC — FREQ. MOD. 88-108MC



DIAL CORD DRIVE

HOWARD W. SAMS & CO., INC. • Indianapolis Indiana

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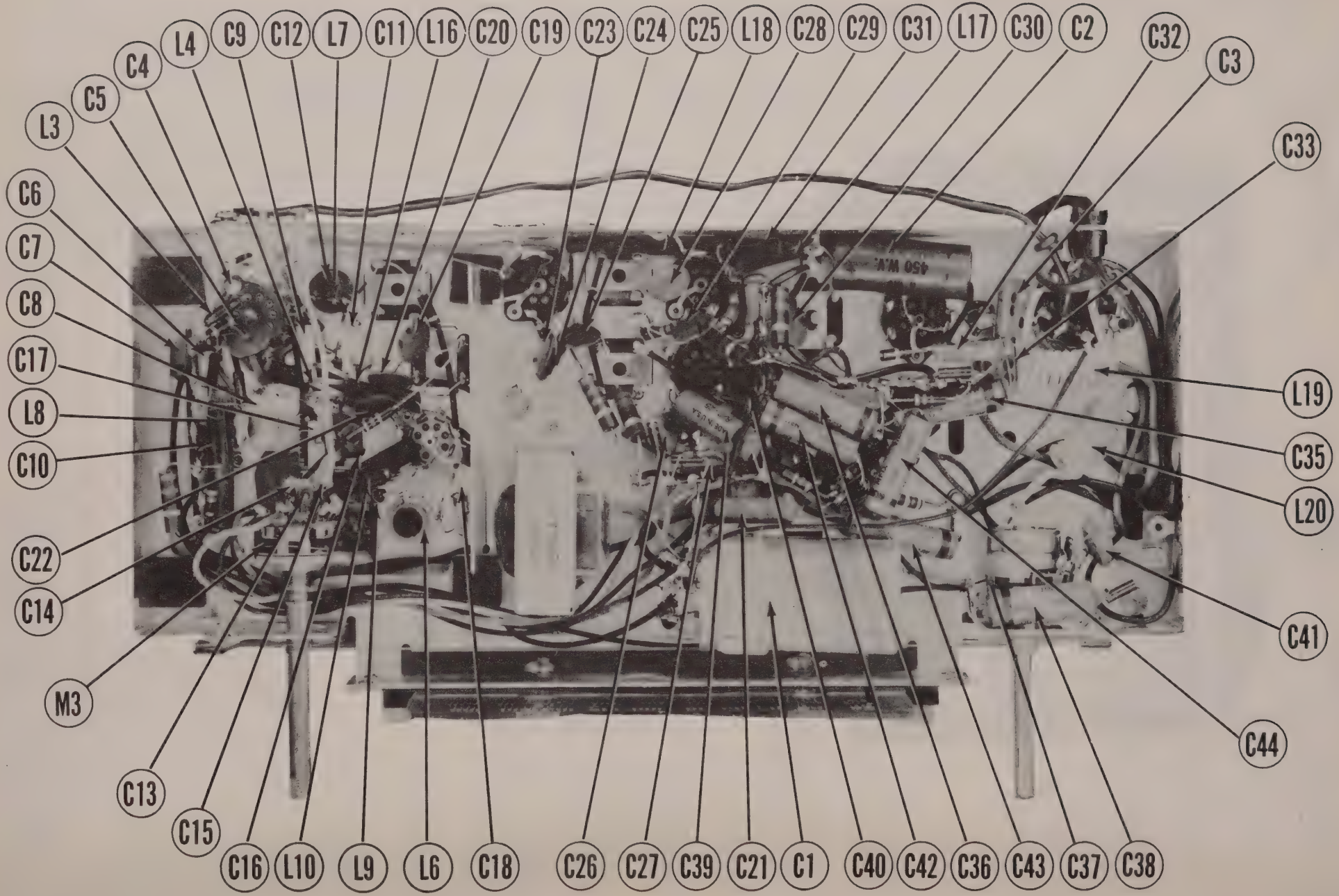
L3
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C44
C41
L20
C35
L19

R23
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R26
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R27
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R22
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R29
R20
A8
A1
R15
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A10
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R3
R2
R5
R8
R14
R10
R4
R11
R12
R34
R9
A3
L1
R16
R17
R18
R19
R13
R33
R30
R31
R32
R24
R1
R28

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: WESTINGHOUSE PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	FM RF Amp.-FM Mixer	12AT7	12AT7	9A	
V2	FM Osc.-AM Converter	6BE6	6BE6	7CH	
V3	1st IF Amp.	6BA6	6BA6	7BK	
V4	2nd FM IF Amp.	6BA6	6BA6	7BK	
V5	Ratio Det.	6AL5	6AL5	6BT	
V6	DET-AVC-AF	6AV6	6AV6	7BT	
V7	Power Output	6V6GT	6V6GT	7AC	
V8	Rectifier	5Y3GT	5Y3GT	5T	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: WESTINGHOUSE PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	20	400	V-6121	AF444J4A	UP		EL-442	● Filter
B	20	400			22245C			■ Filter
C	10	350						▲ Osc. Anode Bypass
D	20	25						Output Cath. Bypass
C2	4	450	V-6638	PRS150/4	BR415		UT-41	Stabilizing Cap
C3	100	500	RCM20A101M	1468-0001	5W5T1	GP1K-100	1FM-31	FM Line Ant. Coupling
C4	100		R3CC305L101M	1468-0001	5W5T1	GP1K-100	1FM-31	Ant. Coupling
C5	5000		V-5596	1467-005	1D5D5	811-005	29C1	FM RF Cath. Bypass
C6	470		R5CC21ZY471M	1468-0005	5W5T5	GP2K-470	1FM-35	AVC Filter
C7	5000		V-5596	1467-005	1D5D5	811-005	29C1	AVC Filter
C8	33		R3CC26CK330M	1468-00004	5W5Q3	GP1K-33	MS-43	RF Coupling
C9	33		R3CC26CK330M	1468-00004	5W5Q3	GP1K-33		RF Coupling
C10	5000		V-5596	1467-005	1D5D5	811-005	29C1	RF Plate Decoupling
C11	100		R3CC305L101J	1469-0001	5R5T1	NP0M-100	MS-31	Fixed Trimmer
C12	5000		V-5596	1467-005	1D5D5	811-005	29C1	FM Mixer Plate Dec.
C13	470		R5CC21ZY471M	1468-0005	5W5T5	GP2K-470	1FM-35	RF Coupling
C14	27		R3CC30CK270K	1468-000025	5W5Q25	GP1K-27	MS-425	Osc. Grid Cap
C15	5		R2CC30CK050D	1469-000005	5R5V5	NP0K-5	MS-55	Osc. Feedback
C16	2		R2CC30UK020D					Fixed Trimmer
C17	2		R2CC30CK020D					Osc. Coupling
C18	470		R5CC21ZY471M	1468-0005	5W5T5	GP2K-470	1FM-35	Osc. Anode Bypass
C19	5000		V-5596	1467-005	1D5D5	811-005	29C1	Conv. Plate Dec.
C20	5000		V-5596	1467-005	1D5D5	811-005	29C1	AVC Filter
C21	.02	200	RCP10W2203A	P488-02	GT2S2		TM-12	AVC Filter
C22	5000		V-5596	1467-005	1D5D5	811-005	29C1	Conv. Fil. Bypass
C23	5000		V-5596	1467-005	1D5D5	811-005	29C1	1st IF Cath. Bypass
C24	5000		V-5596	1467-005	1D5D5	811-005	29C1	1st IF Screen Bypass
C25	5000		V-5596	1467-005	1D5D5	811-005	29C1	1st IF Plate Dec.
C26	100	500	RCM20A101M	1468-0001	5W5T1	GP1K-100	1FM-31	Diode RF Filter
C27	100	500	RCM20A101M	1468-0001	5W5T1	GP1K-100	1FM-31	Diode RF Filter
C28	5000		V-5596	1467-005	1D5D5	811-005	29C1	2nd IF Cath. Bypass
C29	5000		V-5596	1467-005	1D5D5	811-005	29C1	2nd IF Screen Bypass
C30	5000		V-5596	1467-005	1D5D5	811-005	29C1	2nd IF Plate Dec.
C31	.01	200	V-5040-13	P488-01	GT2S1	GP2-335-01	TM-11	2nd IF Fil. Bypass
C32	150	500	RCM20A151J	1468-00015	5W5T15	GP2K-150	1FM-315	Diode Load Cap Note 1
C33	150	500	RCM20A151J	1468-00015	5W5T15	GP2K-150	1FM-315	Diode Load Cap Note 1
C34	.01	200	V-5040-13	P488-01	GT2S1	GP2-335-01	TM-11	DAVC Decoupling Note 2
C35	.002	600	RCP10W6202A	P688-002	GT6D2	GP2M-002	TM-22	De-emphasis
C36	.01	400	RCP10W4103A	P488-01	GT4S1	GP2-335-01	TM-11	Audio Coupling
C37	470	500	RCM20A471M	1468-0005	5W5T5	GP2K-470	1FM-35	Tone Compensation
C38	.05	200	RCP10W2503A	P288-05	GT2S5		TM-15	Tone Compensation
C39	.01	400	RCP10W4103A	P488-01	GT4S1	GP2-335-01	TM-11	Audio Coupling
C40	150	500	RCM20A151M	1468-00015	5W5T15	GP2K-150	1FM-315	AF Plate Bypass
C41	680	500	RCM20A681M	1468-00075	1W5T7	GP2K-680	1FM-37	Tone Compensation
C42	.01	400	RCP10W4103A	P488-01	GT4S1	GP2-335-01	TM-11	Audio Coupling
C43	.03	400	RCP10W4303A	P488-03	GT4S3		TM-13	AF Plate Dec.
C44	.005	600	RCP10M6502A	P688-005	GT6D5		TM-25	Output Plate Bypass

Note 1. When Either Item C32 Or C33 Are Replaced, Replace Both With Capacitors Of Equal Value.

Note 2. Not Used In All Models.

PARTS LIST AND DESCRIPTIONS (Continued)

FILTER CHOKE

ITEM No.	RATINGS: TOTAL DIRECT CURRENT	RATINGS: D. C. RESISTANCE	RATINGS: INDUCTANCE (0 CURRENT 1000 ~)	REPLACEMENT DATA: WESTINGHOUSE PART No.	REPLACEMENT DATA: STANCOR PART No.	REPLACEMENT DATA: MERIT PART No.	REPLACEMENT DATA: CHICAGO PART No.	INSTALLATION NOTES
L1	.110A	240Ω	5.5Henries	V-6161		C-2977	R-1365	

R F COILS

ITEM No.	USE	DC RES.: PRI.	DC RES.: SEC.	REPLACEMENT DATA: WESTINGHOUSE PART No.	REPLACEMENT DATA: MEISSNER PART No.	
L2	Loop Ant.	.8Ω	2Ω	V-6448		
L3	RF Choke	0Ω		V-4886-10		
L4	FM RF Coil	0Ω		V-6806		
L5	FM Osc.Coil	0Ω		V-6138		
L6	AM Osc.Coil	9Ω		V-6164	14-1060	
L7	Parasitic Suppressor	0Ω		V-4886-6		4 Turns Of Enameled Wire On Resistor.
L8	RF Choke	1.5Ω		V-4886-4		
L9	Parasitic Suppressor	0Ω		V-4886-7		2 Turns Of Bare Wire On Resistor.
L10	RF Choke	0Ω		V-4886-2		
L11	FM 1st IF	.5Ω	.5Ω	V-6142		
L12	AM 1st IF	22Ω	22Ω	V-6199-2	16-6678	
L13	FM 2nd IF	.5Ω	.5Ω	V-6129		
L14	AM 2nd IF	22Ω	22Ω	V-6199-2	16-6678	
L15	Ratio Det. Trans.	1Ω	0Ω	V-6128		
L16	Filament Choke	0Ω		V-4886-2		
L17	Filament Choke	1Ω		V-4886-1		
L18	Filament Choke	0Ω		V-4886-2		
L19	Line Choke	0Ω		V-4886-11		10 Turns Covered Wire On 3/8" Air Core.
L20	Line Choke	0Ω		V-4886-11		10 Turns Covered Wire On 3/8" Air Core.

DIAL LIGHTS

ITEM No.	BASE TYPE	VOLTS	AMPS.	BEAD COLOR	REPLACEMENT DATA: WESTINGHOUSE PART No.		NOTES
M1	Bayonet	6-8	.15	Brown	47		Type #47
M2	Bayonet	6-8	.15	Brown	47		Type #47

MISCELLANEOUS

ITEM No.	PART NAME	WESTINGHOUSE PART No.	NOTES
M3	Switch	V-6607-1	
M4	2 Gang Var.Cap.	V-6442	(48-552MMF, 37-212MMF)
A13	Trimmer	V-8139	FM Osc. Adj.
	Dial	V-6123	
	Dial Pointer	V-6125	
	Cabinet	V-1175-1	
	Knob	V-6146-1	Off-On/Tone
	Knob	V-6146-2	Band
	Knob	V-6147-1	Volume (Rear)
	Knob	V-6147-2	Tuning (Rear)

PARTS LIST AND DESCRIPTIONS (Continued)

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA			INSTALLATION NOTES
	RESISTANCE	WATTS	WESTINGHOUSE PART No.	IRC PART No.	CLAROSTAT PART No.	
R1A B	500KΩ 2 Meg.	½ ½	V-6122			Volume control, tapped @ 50KΩ (Dual) Tone control and switch (Concentric)

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		IDENTIFICATION CODES
	RESISTANCE	WATTS	WESTINGHOUSE PART No.	IRC PART No.	
R2	470KΩ	½	RC10AE474M	BTS-470K	FM RF Grid
R3	82Ω	½	RC10AE820K	BW-½-82	FM RF Cathode
R4	5600Ω	1	RC30AE562K	BTA-5600	FM RF Plate Decoupling
R5	15Ω	½	RC10AE150M		Parasitic Supp.
R6	470KΩ	½	RC10AE474M	BTS-470K	FM Mixer Grid
R7	1000Ω	½	RC10AE102K	BTS-1000	FM Mixer Plate Decoupling
R8	2.2 Meg.	½	RC10AE225M	BTS-2.2 Meg.	AVC Network
R9	33Ω	½	RC10AE330K		Parasitic Supp.
R10	4700Ω	½	RC10AE472K	BTS-4700	AM Conv. Plate Decoupling
R11	22KΩ	½	RC10AE223K	BTS-22K	Osc. Grid
R12	1 Meg.	½	RC10AE105M	BTS-1 Meg.	AVC Network
R13	1 Meg.	½	RC10AE105M	BTS-1 Meg.	AVC Network
R14	12KΩ	2	RC41AE123K	BT-2-12K	Filter
R15	68Ω	½	RC10AE680K	BW-½-68	1st IF Cathode
R16	33KΩ	1	RC30AE333K	BTA-33K	1st IF Screen
R17	3300Ω	1	RC30AE332K	BTA-3300	1st IF Plate Decoupling
R18	47KΩ	½	RC10AE473M	BTS-47K	Diode Filter
R19	2.2 Meg.	½	RC10AE225M	BTS-2.2 Meg.	Diode Load
R20	68Ω	½	RC10AE680K	BW-½-68	2nd FM IF Cathode
R21	33KΩ	1	RC30AE333K	BTA-33K	2nd FM IF Screen
R22	3300Ω	1	RC30AE332K	BTA-3300	2nd FM IF Plate Decoupling
R23	220Ω	½	RC10AE221M	BW-½-220	Balancing
R24	47KΩ	½	RC10AE473M	BTS-47K	De-emphasis
R25	15KΩ	½	RC10AE153K	BTS-15K	Ratio Det. Diode Load
R26	220KΩ	½	RC10AE224M	BTS-220K	AVC Network
R27	3.3 Meg.	½	RC10AE335M	BTS-3.3 Meg.	Delayed AVC
R28	1500Ω	½	RC10AE152M	BTS-1500	Tone Compensation
R29	10 Meg.	½	RC10AE106M	BTS-10 Meg.	AF Grid
R30	470KΩ	½	RC10AE474M	BTS-470K	AF Plate
R31	150KΩ	½	RC10AE154M	BTS-150K	AF Plate Decoupling
R32	470KΩ	½	RC10AE474M	BTS-470K	Output Grid
R33	270Ω	1	RC30AE271K	BW-1-270	Output Cathode
R34	470KΩ	½	RC10AE474M	BTS-470K	AVC Network

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA			
	PRI.	SEC. 1	SEC. 2	SEC. 3	WESTINGHOUSE PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.
T1	117VAC @ .73A	600VCT .11ADC	5VAC @ 2A	6.3VAC @ 2.5A	V-6667	P-6013#	P-2953#	PV-120

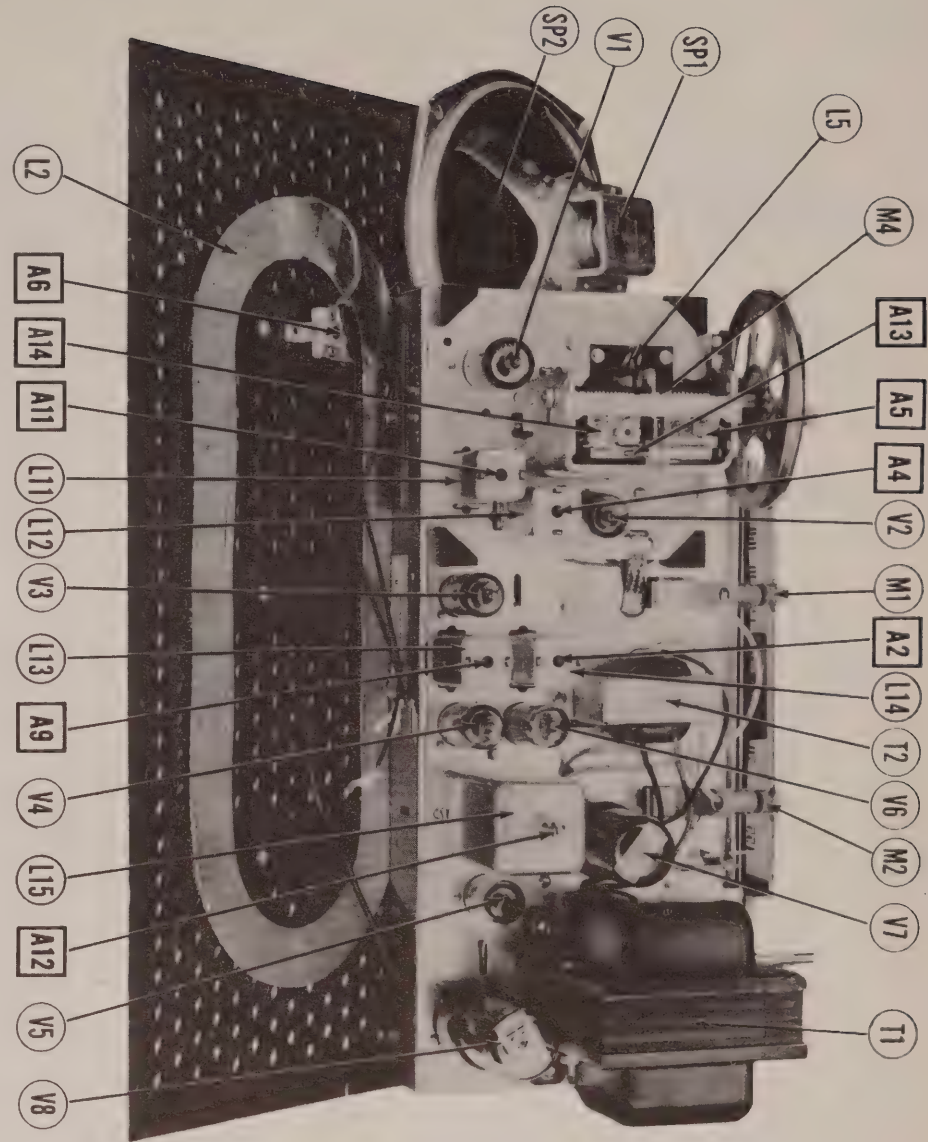
Add Series Resistor To Reduce Plate Voltage And Mount Vertically With Universal Mounting Brackets.

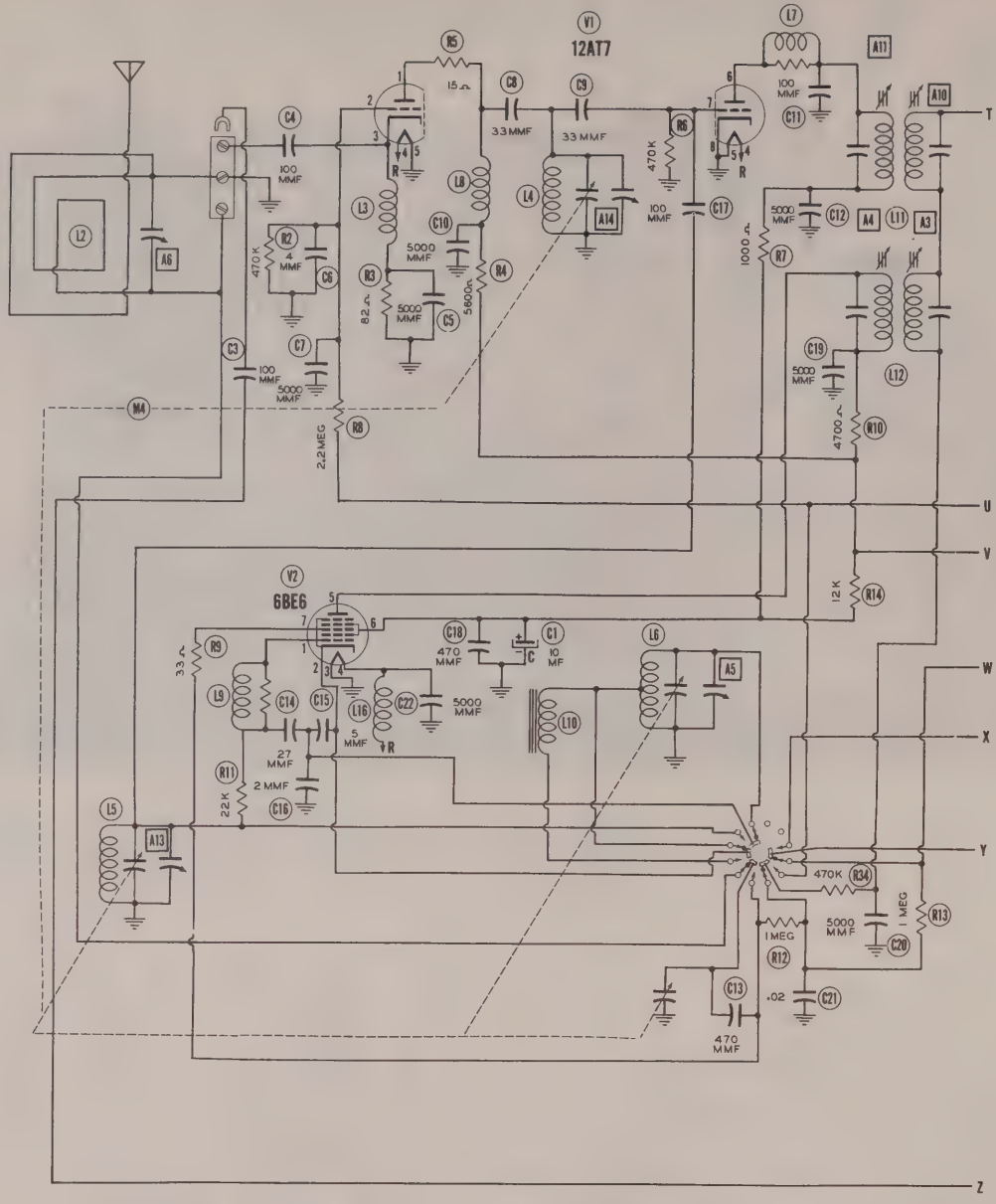
TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA				INSTALLATION NOTES
	IMPEDANCE		DC RES.		WESTING-HOUSE PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
	PRI.	SEC.	PRI.	SEC.					
T2	4800Ω	3.7Ω	400Ω	.4Ω	V-5798	A-3823	A-2902	RO-9#	‡ Drill One New Mtg. Hole.

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA			INSTALLATION NOTES
			WESTING-HOUSE PART No.	JENSEN PART No.	QUAM PART No.	
SP1	FIELD PM CONE DIA.	V.C. IMP. 3.7Ω V.C. DIA.	V-6449	ST-109 MOD.P6-W	6A15	
SP2	4 7/8"	3/4"				





IF=455KC AM

IF= 10.7 MC FM

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
‡V1	12AT7	205VDC	0V	.9VDC	0V	0V	115VDC	-2.2VDC	0V	6.3VAC
V2A	6BE6	$-7.3 VDC	0V	0V	6.3VAC	270VDC	105VDC	-.1VDC		
‡ V2B	6BE6	$-.2VDC	0V	0V	6.3VAC	260VDC	115VDC	-1VDC		
V3	6BA6	-.1VDC	0V	0V	6.3VAC	235VDC	115VDC	.9VDC		
‡V4	6BA6	0V	0V	0V	6.3VAC	235VDC	115VDC	1VDC		
‡V5	6AL5	-.2VDC	-.2VDC	0V	6.3VAC	0V	0V	-.3VDC		
V6	6AV6	-.6VDC	0V	0V	6.3VAC	.6VDC	-.6VDC	90VDC		
V7	6V6GT	0V	6.3VAC	250VDC	270VDC	0V	240VDC	0V	12VDC	
V8	5Y3GT	0V	300VDC	0V	300VAC	0V	300VAC	0V	300VDC	

$ Taken With Vacuum Tube Voltmeter.
‡ Taken In FM Position.

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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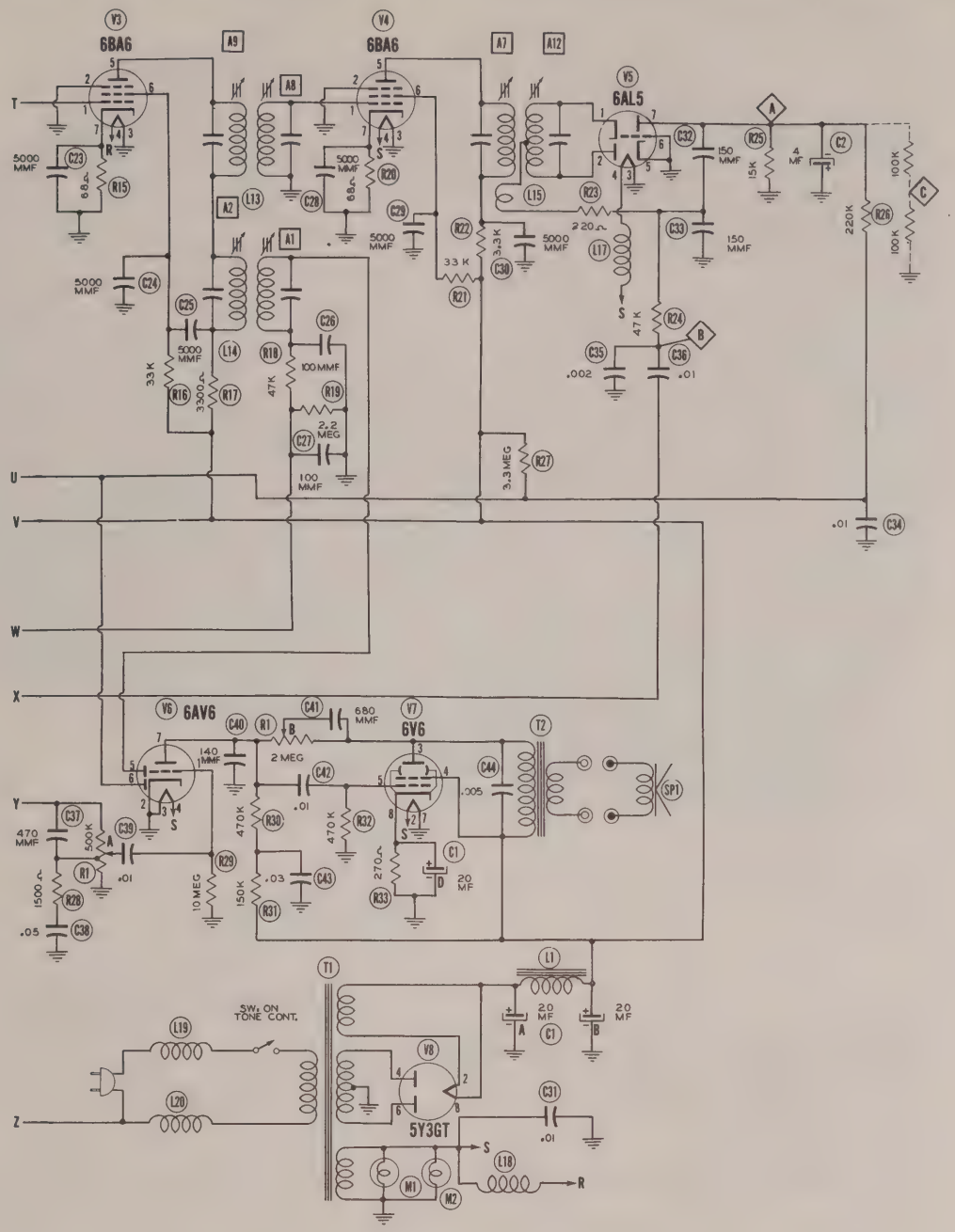

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
‡V1	12AT7	†6KΩ	470KΩ	92Ω	0Ω	0Ω	†13KΩ	470KΩ	0Ω	.1Ω
V2A	6BE6	22KΩ	1Ω	0Ω	.1Ω	†5KΩ	†13KΩ	2.5 Meg.		
‡ V2B	6BE6	22KΩ	1Ω	0Ω	.1Ω	†5KΩ	†13KΩ	4 Meg.		
V3	6BA6	2 Meg.	0Ω	0Ω	.1Ω	†4KΩ	†33KΩ	68Ω		
‡V4	6BA6	.5Ω	0Ω	0Ω	.1Ω	†4KΩ	†33KΩ	68Ω		
‡V5	6AL5	Inf.	Inf.	0Ω	.1Ω	0Ω	0Ω	14KΩ		
V6	6AV6	10 Meg.	0Ω	0Ω	.1Ω	2.2 Meg	500KΩ	†600KΩ		
V7	6V6GT	0Ω	.1Ω	†650Ω	†250Ω	470KΩ	†150KΩ	0Ω	270Ω	
V8	5Y3GT	Inf.	90KΩ	Inf.	87Ω	Inf.	94Ω	Inf.	90KΩ	

† Measured From Pin 8 Of V8.

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ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

To set pointer turn tuning cap fully closed and set pointer to last reference mark at low frequency end of dial.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.
Before aligning FM IF system make sure AM IF system is properly aligned.

AM ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High to stator of AM antenna section of tuning gang. Low side to chassis.	455KC (400∿ Mod.)	AM (second position clockwise.)	Tuning gang fully closed	Across voice coil	A1,A2 A3,A4	Adjust for max. output.
2.		Loop	1600KC	"	1600KC	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust of max. output.
3.		Loop	1400KC	"	Tune for max. output.	"	A6	Adjust for max. output. Rock tuning gang thru 1400KC while adjusting A6.

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect two matched 100KΩ (± 1%) resistors in series from point (A) to chassis. The junction of these two resistors is alignment point (C) as shown on the schematic.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
4.	.01MFD	High side to stator of FM antenna section of tuning gang. Low side to chassis.	10.7MC (Unmod.)	FM (ext. counter clockwise)	Tuning gang fully closed	DC Probe to Point (A) Common to chassis.	A7,A8, A9,A10 A11	Adjust for maximum deflection. A7 peaks at two points, use the point with slug farthest out.
5.	.01MFD	"	"	"	"	DC Probe to Point (B) Common to Point (C)	A12	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
4.	.01MFD	High side to stator of FM antenna section. of tuning gang. Low side to chassis.	10.7MC (450KC Sweep)	FM (ext. counter clockwise)	Tuning gang fully closed	Vert.Amp. to Point (A) Low side to chassis.	A7,A8, A9,A10 A11	Disconnect stabilizer cap C2. Adjust for max. amplitude and symmetry as per Fig 1.
5.	.01MFD	"	"	"	"	Vert.Amp. to Point (B) Low side to chassis.	A12	Reconnect capacitor C2. Adjust A12 so that 10.7MC marker occurs at center of crossover lines. Slightly retouch A7 for maximum amplitude and straightness of diagonal lines as per Fig 2.

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
6.	300Ω carbon res.	High side to terminal 1 of antenna strip thru 300Ω resistor. Low side to chassis.	105MC	FM	105MC	DC Probe to Point (A) Common to chassis.	A13, A14	Adjust for max. deflection.

FIG. 1

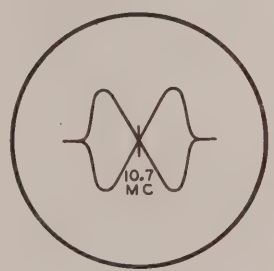
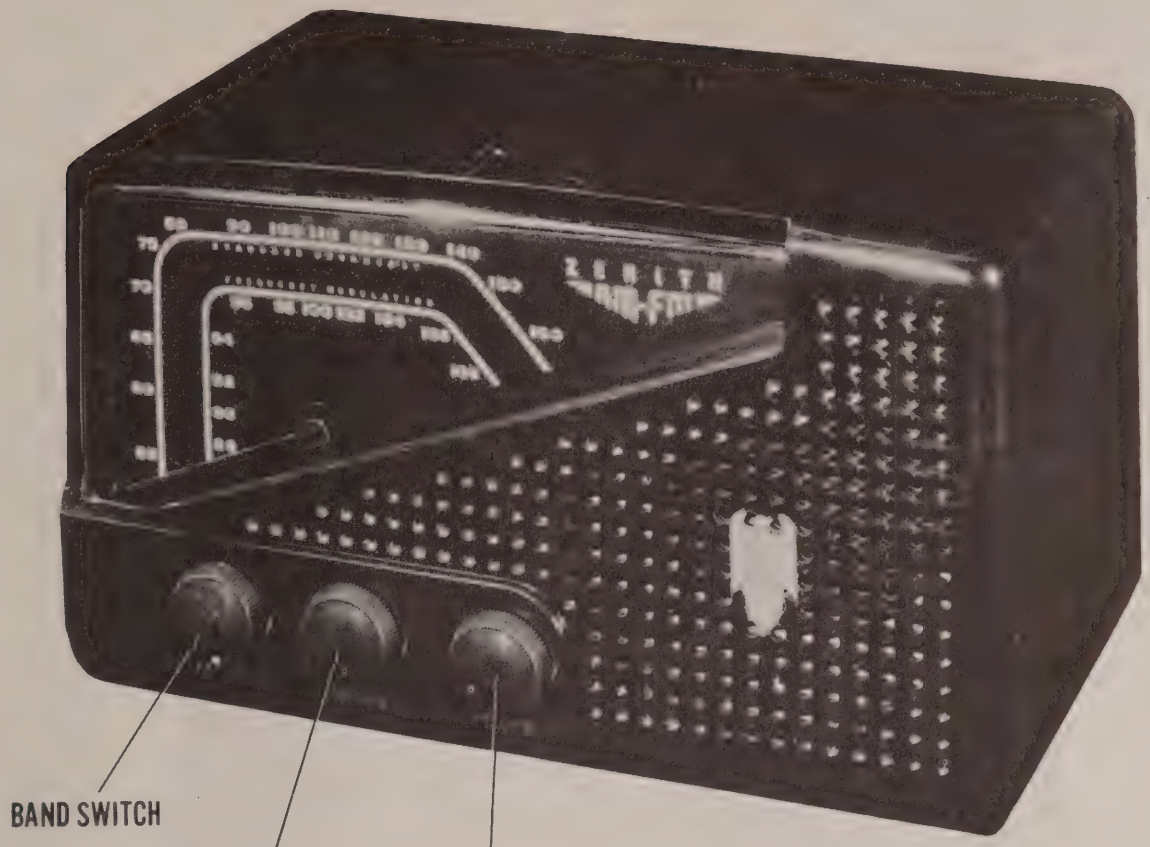


FIG. 2

ZENITH MODEL
7H921 (Ch. 7F04)



ZENITH MODEL
7H921 (Ch. 7F04)

ZENITH MODEL 7H921

TRADE NAME	Zenith, Model 7H921 (Ch. 7F04)
MANUFACTURER	Zenith Radio Corp., 6001 Dickens Ave., Chicago 39, Illinois
TYPE SET	AC-DC Operated AM-FM Superheterodyne Receiver with Loop Antenna
TUBES(SEVEN)	Types 12BA6 FM RF Amp., 12BE6 Converter, 12BA6 1st IF Amp., 12BA6 FM 2nd IF Amp., 12AU6 Limiter, 19T8 DET-AVC-AF, 35B5 Power Output.
POWER SUPPLY	110-120 Volts AC-DC RATING: .32 Amp. @ 117 Volts AC
TUNING RANGE-BROADCAST	540-1620KC FREQ. MOD. 88-108MC

HOWARD W. SAMS & CO., INC. • Indianapolis Indiana

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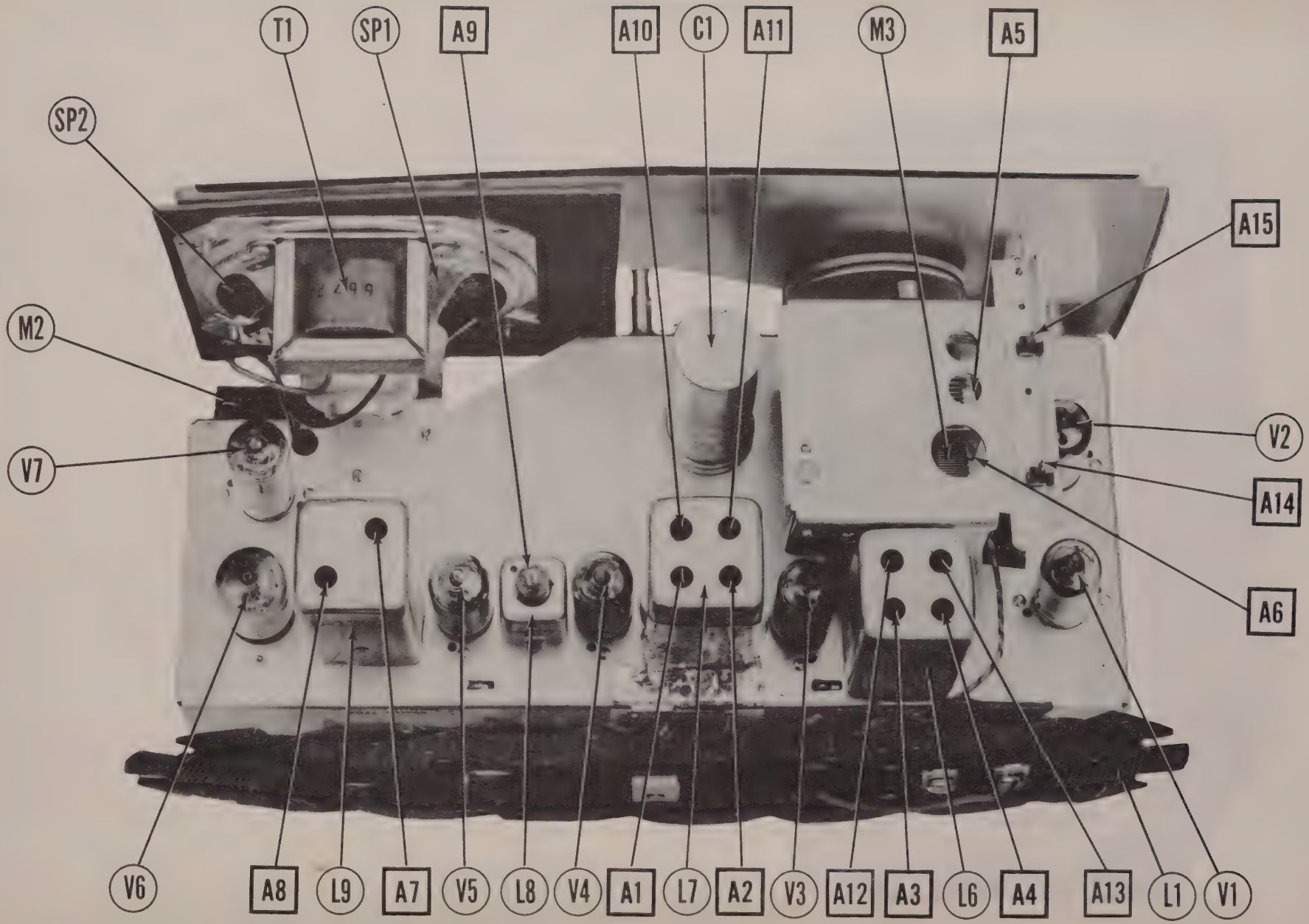
DATE 10/49 SET #73 FOLDER #16


T1
SP1
A9
A10
C1
A11
M3
A5
SP2
A15
M2
V2
V7
A14
A6
V6
A8
L9
A7
V5
L8
V4
A1
L7
A2
V3
A12
A3
L6
A4
A13
L1
V1

L2
R2
C3
C4
C25
C5
L3
C7
L11
R6
C8
R5
C26
L10
C6
L4
C9
C2
R4
C11
R10
R26
C12
R12
C28
R14
C14
C16
C17
R15
R16
C
R17
B
R21
R18
A
R3
M1
R7
R8
L5
C13
R9
R13
R27
R1
C19
C10
R11
C21
R29
C24
C15
C23
C27
C18
R28
R25
R24
R23
C20
C22
R22
R19
R20

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA or Equivalent)

ITEM No.	USE	REPLACEMENT DATA: ZENITH PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RMA BASE TYPE	INSTALLATION NOTES
V1	FM RF Amp.	12BA6	12BA6	7BK	
V2	Converter	12BE6	12BE6	7CH	
V3	1st IF Amp.	12BA6	12BA6	7BK	
V4	FM 2nd IF Amp.	12BA6	12BA6	7BK	
V5	Limiter	12AU6	12AU6	7BK	
V6	DET-AVC-AF	19T8	19T8	9E	
V7	Power Output	35B5	35B5	7BZ	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: ZENITH PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
C1A	80	150	22-1757	AF888D*	UP8415		EL-340*	■ Filter
B	40	150						▲ Filter
C2	.01	200	22-1385	P488-01	GT2S1			Antenna Isolation
C3	1000		22-1676	1468-001	1W5D1	GP2L-001	1FM-21	RF Cathode Bypass
C4	1000		22-1676	1468-001	1W5D1	GP2L-001	1FM-21	RF Decoupling
C5	19		22-1688		5R5Q2	NP0K-20	MS-42	Fixed Trimmer
C6	50		22-1492	1469-00005	5R5Q5	NP0M-50	MS-45	Fixed Trimmer
C7	.01	200	22-1385	P488-01	GT2S1	GP2-335-01	TM-11	Conv. Screen Bypass
C8	50		22-1492	1468-00005	5W5Q5	GP1K-50	1FM-45	Osc. Grid Cap
C9	.01	200	22-1385	P488-01	GT2S1	GP2-335-01	TM-11	Conv. Plate Decoupling
C10	.05	200	22-829	P288-05	GT2S5		TM-15	AVC Filter
C11	.01	200	22-1385	P488-01	GT2S1	GP2-335-01	TM-11	AVC Filter
C12	.002	600	22-1220	P688-002	GT6D2	GP2M-002	TM-22	1st IF Decoupling
C13	.01	200	22-1385	P488-01	GT2S1	GP2-335-01	TM-11	1st IF Decoupling
C14	.01	200	22-1385	P488-01	GT2S1	GP2-335-01	TM-11	2nd IF Cathode Bypass
C15	30		22-1768					Fixed Trimmer
C16	.002	600	22-1220	P688-002	GT6D2	GP2M-002	TM-22	2nd IF Decoupling
C17	25		22-1507	1468-000025	5W5Q25	GP1K-25	MS-425	If Coupling
C18	.01	200	22-1385	P488-01	GT2S1	GP2-335-01	TM-11	Limiter Decoupling
C19	.05	200	22-1158	P488-05	GT2S5		TM-15	Tone Compensation
C20	.0005	600	22-854	1468-0005	GT6T5	GP2K-500	TC-35	AF Plate Bypass
C21	.02	600	22-830	P688-02	GT6S2		TM-12	Audio Coupling
C22	.005	600	22-229	P688-005	GT6D5	GP2M-005	TM-25	Audio Coupling
C23	.01	400	22-1126	P488-01	GT4S1	GP2-335-01	TM-11	Output Plate Bypass
C24	.01	200	22-1385	P488-01	GT2S1	GP2-335-01	TM-11	2nd IF Fil. Bypass
C25	10000		22-3	P488-01	GT4S1	821-01	36C1	RF Fil. Bypass
C26	.01	200	22-1385	P488-01	GT2S1	GP2-335-01	TM-11	Output Fil. Bypass
C27	.05	400	22-1017	P488-05	GT4S5		TM-15	Line Filter
C28	100	500	22-162	1468-0001	5W5T1	GP1K-100	1FM-31	Antenna Coupling

* Parallel Sections To Obtain Desired Capacity.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: ZENITH PART No.	IRC PART No.	CLAROSTAT PART No.	INSTALLATION NOTES
R1A	1 Meg.	½	63-1646	Q11-137	AM-61-S	Volume control
B	Shaft		Not Req.	Not Req.	KSS-3	Attach to R1A per instructions
C	Switch		Not Req.	76-1	SW-A	Attach to R1A per instructions

PARTS LIST AND DESCRIPTIONS (Continued)

R F COILS

ITEM No.	USE	DC RES.: PRI.	DC RES.: SEC.	REPLACEMENT DATA: ZENITH PART No.	REPLACEMENT DATA: MEISSNER PART No.
L4	FM Osc.Coil	0Ω		S-14695	
L5	AM Osc.Coil	.5Ω	5Ω	S-14481	14-1060
L6A	FM 1st IF	.5Ω	†	S-14521	
B	AM 1st IF	19Ω	†		
L7A	FM 2nd IF	‡	.5Ω	S-14522	
B	AM 2nd IF	‡	15Ω		
L8	3rd FM IF	1Ω		S-14509	
L9	Disc.Trans	.4Ω	.4Ω	S-13973	
L10	Filament Choke	.8Ω		S-13997	
L11	Filament Choke	.8Ω		S-13997	

† Resistance Of Both Secondaries 19Ω

‡ Resistance Of Both Primaries 16Ω

MISCELLANEOUS

ITEM No.	PART NAME	ZENITH PART No.	NOTES
M1	Switch	85-430	Band
M2	Rectifier	212-3	Selenium
M3	2 Gang Var.Cap.	22-1742	(16-464MMF, 34-204MMF)
	Dial Scale	26-403	
	Dial Glass	192-117	
	Dial Pointer	59-146	
	Cabinet	14-1022	
	Cabinet	14-855	White

PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		IDENTIFICATION CODES
	RESISTANCE	WATTS	ZENITH PART No.	IRC PART No.	
R2	68Ω	½	63-1737	BW-½-68	FM RF Cathode
R3	680Ω	½	63-1779	BTS-680	FM RF Decoupling
R4	220Ω	½	63-1758	BW-½-220	Conv. Plate Decoupling
R5	22KΩ	½	63-1842	BTS-22K	Osc. Grid
R6	220Ω	½	63-1758	BW-½-220	Osc. Anode Decoupling
R7	100Ω	½	63-1744		Parasitic Supp.
R8	1Ω	½	63-1223	BW-½-1	Decoupling Wire Wound
R9	100KΩ	½	63-1870	BTS-100K	1st IF Grid
R10	220Ω	½	63-1758	BW-½-220	1st IF Decoupling
R11	47KΩ	½	63-1856	BTS-47K	Diode Filter
R12	1 Meg.	½	63-1912	BTS-1 Meg.	Diode Load
R13	2.2 Meg.	½	63-1926	BTS-2.2 Meg	AVC Network
R14	68Ω	½	63-1737	BW-½-68	2nd FM IF Cathode
R15	220Ω	½	63-1758	BW-½-220	2nd FM IF Decoupling
R16	100KΩ	½	63-1870	BTS-100K	Limiter Grid
R17	15KΩ	½	63-1835	BTS-15K	Limiter Decoupling
R18	150KΩ	½	63-1876	BTS-150K	Disc. Diode Load
R19	150KΩ	½	63-1876	BTS-150K	Disc. Diode Load
R20	22KΩ	½	63-1842	BTS-22K	De-emphasis
R21	2200Ω	½	63-1800	BTS-2200	De-emphasis
R22	4.7 Meg.	½	63-1940	BTS-4.7 Meg	AF Grid
R23	470KΩ	½	63-1898	BTS-470K	AF Plate
R24	470KΩ	½	63-1898	BTS-470K	Output Grid
R25	150Ω	1	63-686	BW-1-150	Output Cathode Wire Wound
R26	2200Ω	½	63-1800	BTS-2200	Tone Compensation
R27	1500Ω	½	63-1793	BTS-1500	Tone Compensation
R28	22Ω	1	63-1450		Surge Limiter Wire Wound
R29	1000Ω	3	63-1527	AB-1000	Filter Wire Wound

TRANSFORMER (AUDIO OUTPUT)

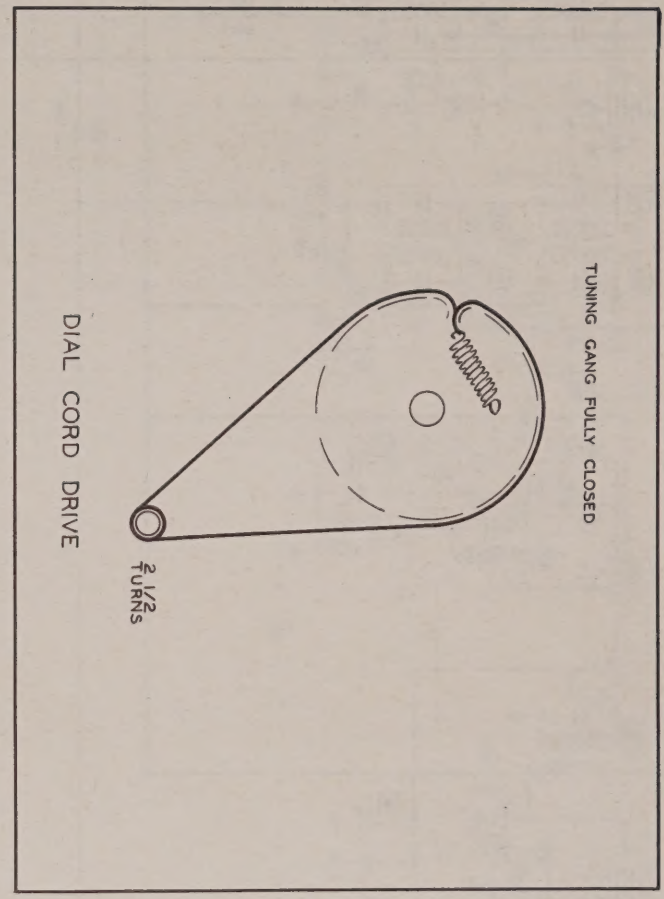
ITEM No.	RATING				REPLACEMENT DATA				INSTALLATION NOTES
	IMPEDANCE		DC RES.		ZENITH PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
	PRI.	SEC.	PRI.	SEC.					
T1	3500Ω	3.5Ω	260Ω	.5Ω	206-667	A-3876	A-2928	RO-2	

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA			INSTALLATION NOTES
			ZENITH PART No.	JENSEN PART No.	QUAM PART No.	
SP1	FIELD	V.C. IMP.		ST-113†		
	PM	3.5Ω	49-667	MODEL P4-X	4A07†	† Remount Output Transformer
SP2	CONE DIA.	V.C. DIA.				
	3 7/8"	9/16"	208-667			

R F COILS

ITEM No.	USE	DC RES.		REPLACEMENT DATA		
		PRI.	SEC.	ZENITH PART No.	MEISSNER PART No.	
L1	AM Loop Ant	1.5Ω		S-14527		
L2	FM Ant.Coil	.2Ω	0Ω	S-14480		
L3	FM RF Coil	0Ω	0Ω	S-13871		



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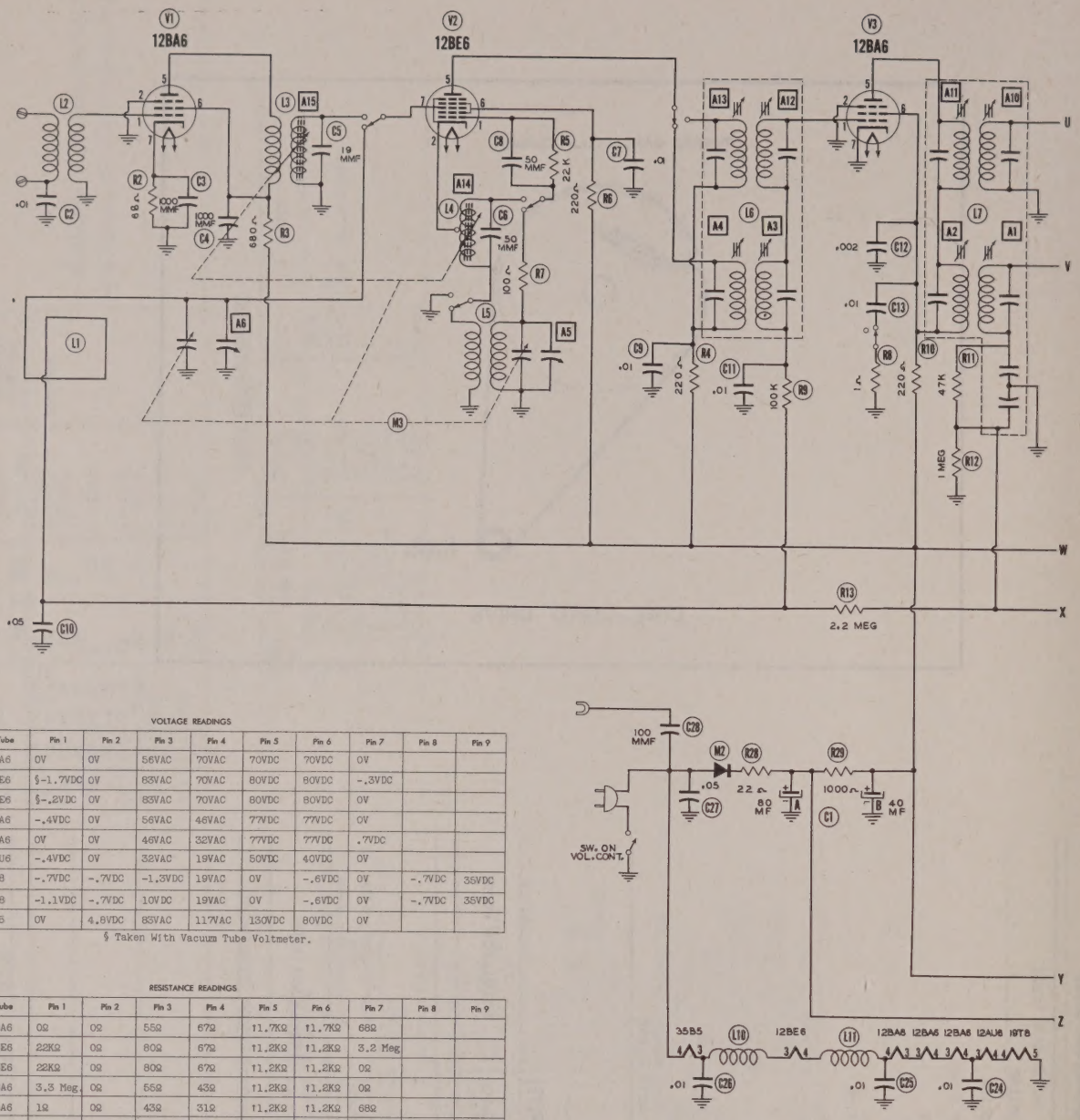

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
‡V1	12BA6	0V	0V	56VAC	70VAC	70VDC	70VDC	0V		
V2A	12BE6	§-1.7VDC	0V	63VAC	70VAC	80VDC	80VDC	-.3VDC		
+ V2B	12BE6	§-.2VDC	0V	63VAC	70VAC	80VDC	80VDC	0V		
V3	12BA6	-.4VDC	0V	56VAC	46VAC	77VDC	77VDC	0V		
‡V4	12BA6	0V	0V	46VAC	32VAC	77VDC	77VDC	.7VDC		
‡V5	12AU6	-.4VDC	0V	32VAC	19VAC	50VDC	40VDC	0V		
V6A	19T8	-.7VDC	-.7VDC	-1.3VDC	19VAC	0V	-.6VDC	0V	-.7VDC	35VDC
+ V6B	19T8	-1.1VDC	-.7VDC	10VDC	19VAC	0V	-.6VDC	0V	-.7VDC	35VDC
V7	35B5	0V	4.8VDC	85VAC	117VAC	130VDC	80VDC	0V		

§ Taken With Vacuum Tube Voltmeter.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
‡V1	12BA6	0Ω	0Ω	55Ω	67Ω	†1.7KΩ	†1.7KΩ	68Ω		
V2A	12BE6	22KΩ	0Ω	80Ω	67Ω	†1.2KΩ	†1.2KΩ	3.2 Meg		
+ V2B	12BE6	22KΩ	0Ω	80Ω	67Ω	†1.2KΩ	†1.2KΩ	0Ω		
V3	12BA6	3.3 Meg.	0Ω	55Ω	43Ω	†1.2KΩ	†1.2KΩ	0Ω		
‡V4	12BA6	1Ω	0Ω	43Ω	31Ω	†1.2KΩ	†1.2KΩ	68Ω		
‡V5	12AU6	100KΩ	0Ω	31Ω	19Ω	†16KΩ	†16KΩ	0Ω		
V6A	19T8	150KΩ	150KΩ	300KΩ	19Ω	0Ω	500KΩ	0Ω	4.7Meg	†470KΩ
+ V6B	19T8	150KΩ	150KΩ	300KΩ	19Ω	0Ω	1 Meg.	0Ω	4.7Meg	†470KΩ
V7	35B5	470KΩ	150Ω	80Ω	115Ω	270Ω	1000Ω	470KΩ		

† Measured From Output Of M2.
+ Taken In FM Position.

1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 10% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

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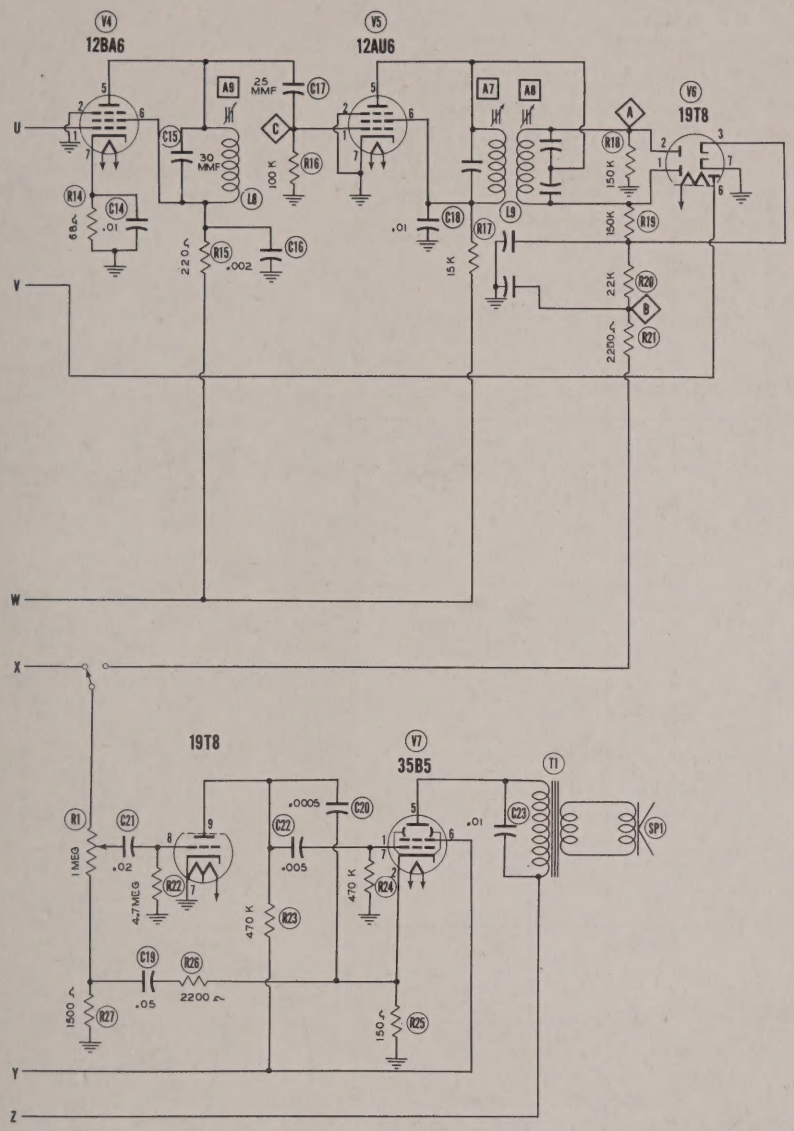

IF = 455 KC AM

IF = 10.7 MC FM

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use isolation transformer if available. If not, connect a .1MFD capacitor in series with low side of signal generator and chassis.

If the receiver is to be completely aligned it should be done in the order given.

In the event of replacement of any part in the AM IF section realignment of the FM IF section will be necessary.

AM ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.05MFD	High side to pin 7 (Grid) of 12BE6 (V2). Low side to chassis.	455KC (400∿ Mod.)	AM (counter clock-wise)	Tuning gang fully closed	Across voice coil	A1,A2, A3,A4	Adjust for maximum output. If isolation transformer is not used reduce dummy antenna to .001MFD to reduce hum modulation.
2.		Loop	1600KC (400∿ Mod.)	"	1600KC	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		Loop	1400KC (400∿ Mod.)	"	1400KC	"	A6	"

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect a 2 Meg resistor in series with DC Probe of VTVM.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
4.	.05MFD	High side to pin 1 (Grid) of 12AU6 (V5). Low side to chassis.	10.7MC (Unmod.)	FM (clock-wise)	Tuning gang fully closed	DC Probe thru 2 Meg. to Point (A) Common to chassis.	A7	Adjust for maximum deflection.
5.	.05MFD	"	"	"	"	DC Probe thru 2 Meg. to Point (B) Common to chassis.	A8	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
6.	.05MFD	High side to pin 1 (Grid) of 12BA6 (V4). Low side to chassis.	"	"	"	DC Probe thru 2 Meg. to Point (C) Common to chassis.	A9	Adjust for maximum deflection.
7.	.05MFD	High side to pin 1 (Grid) of 12BA6 (V3). Low side to chassis.	"	"	"	"	A10, A11	"
8.	.05MFD	High side to pin 7 (Grid) of 12BE6 (V2). Low side to chassis.	"	"	"	"	A12, A13	"

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Connect a 2 Meg. resistor in series with the vertical amp. lead of the oscilloscope.

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
4.	.05MFD	High side to pin 1 (Grid) of 12BA6 (V4). Low side to chassis.	10.7MC (450KC Sweep)	FM (clock-wise)	Point of non interference	Vert.Amp. thru 2 Meg. to Point (A) Low side to chassis.	A7,A9	Adjust for maximum amplitude and symmetry as per Fig 1.
5.	.05MFD	"	"	"	"	Vert.Amp. thru 2 Meg. to Point (B) Low side to chassis.	A7,A8	Adjust A8 so 10.7MC occurs at center of crossover lines as per Fig 2. Slightly retouch A7 for maximum amplitude and straightness of crossover lines.
6.	.05MFD	High side to pin 1 (Grid) of 12BA6 (V3). Low side to chassis.	"	"	"	Vert.Amp. to Point (C) Low side to chassis.	A10, A11	Adjust for maximum amplitude and symmetry as per Fig 1.
7.	.05MFD	High side to pin 7 (Grid) of 12BE6 (V2) Low side to chassis.	"	"	"	"	A12, A13	Adjust for maximum amplitude and symmetry as per Fig 1. Continue with step 9.

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
9.	270Ω carbon res.	Across antenna terminals with 270Ω in series with high side.	98MC (Unmod.)	FM	98MC	DC Probe to Point (C) Common to chassis.	A14	Adjust for maximum deflection.
10.	"	"	"	"	"	"	A15	"

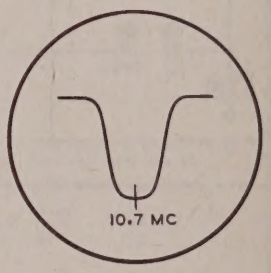

FIG. 1

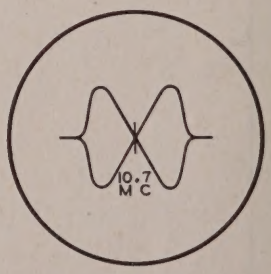

FIG. 2